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ABSTRACT

Developed for sixth-, ninth-, and tenth-grade teachers involved in outdoor education, this guidebook presents a comprehensive approach to program planning and curriculum development in the out-of-doors. Included are preliminary planning checklists, duties, information and consent forms, and topic summaries. Two-thirds of the book is devoted to individual earth science study topics. Each unit of study provides instruction sheets giving its purpose, equipment required, procedures to follow, and data recording sheets. Concluding sections cover relationships of resources, follow-up activities in different subject areas, a large booklist, and audio-visual resources available. A guidebook of similar design, dealing specifically with junior biology field studies is also available. [Not available in hardcopy due to marginal legibility of original document.] (BL)

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OUTDOOR EDUCATION

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BOARD OF EDUCATION FOR THE CITY OF HAMILTON

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ABOUT THIS BOOKLET

This booklet has been prepared for the use of all teachers and student teachers who will be involved in the Outdoor Education Centre of the Hamilton Board of Education.

Although the studies included in the booklet have been tested, they do not represent the final answer to all learning situations. Any comments or suggestions for the improvement of this booklet will be welcomed.

John H. Aikman

M. David Brown

Outdoor Education Centre Staff

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THE OUTDOOR EDUCATION CENTRE

The Outdoor Education Program was begun in the fall of 1969 with the expressed desire of allowing every pupil in Grade 6 and in the Grade 9 and 10 Biology Course to participate in at least one full day in the out-of-doors. Through this program it is hoped that each pupil will gain a better insight into and an appreciation for the world around us. The pupils will be in situations which allow for greater social interactions between themselves. They will also be able to investigate not only what is in our environment but also why it is there. The interdependence of all things in nature will be stressed.

The program is intended to be one encompassing many of the teaching disciplines such as Mathematics, English, Science, Art, Physical Education, Health, Geography, History and Music. Although only a few of these disciplines are actually used during a typical day, it is hoped that the regular classroom teacher will expand the follow-up lessons into as many different situations as possible.

The Outdoor Education Program has two centres in operation at present. The West Centre is located in a portable classroom located on the grounds of George R. Allan School, King Street West at Bond Street North, and makes use of the Westdale Ravine area of the Royal Botanical Gardens. Pupils who go to schools west of Wentworth Street will attend this centre. The other half of the city will go to the East Centre located in a portion of Red Hill School on Albright Road at Mount Albion Road. The East Outdoor Centre makes use of the parkland located in and around the Red Hill Creek Valley.

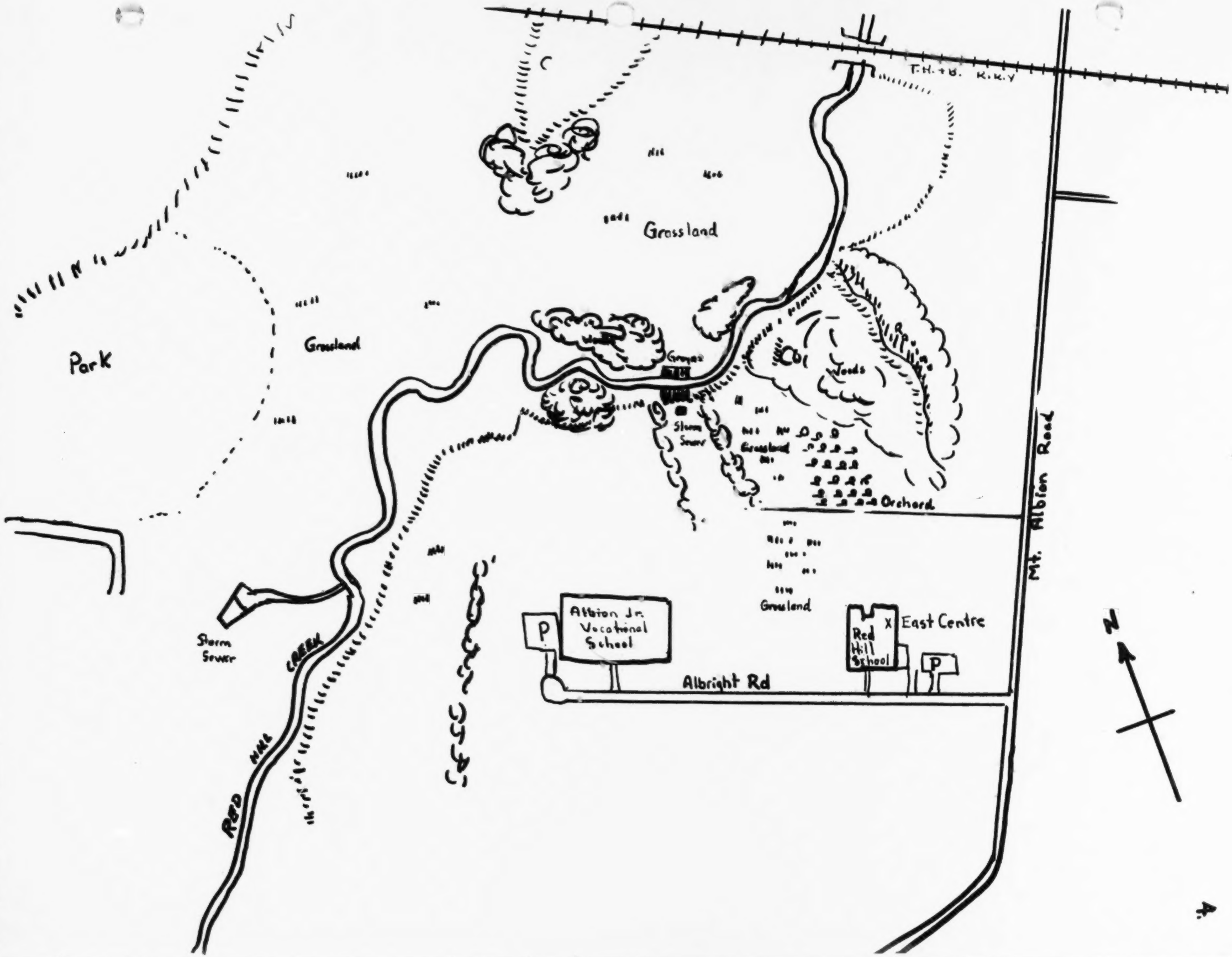
The Outdoor Centres are operated Tuesday to Friday each week for all Grade 6, Special Education, and Grade 9 and 10 Biology classes scheduled on a regular basis. The staff includes two Outdoor Education teachers, plus four student teachers from the Hamilton Teachers' College.

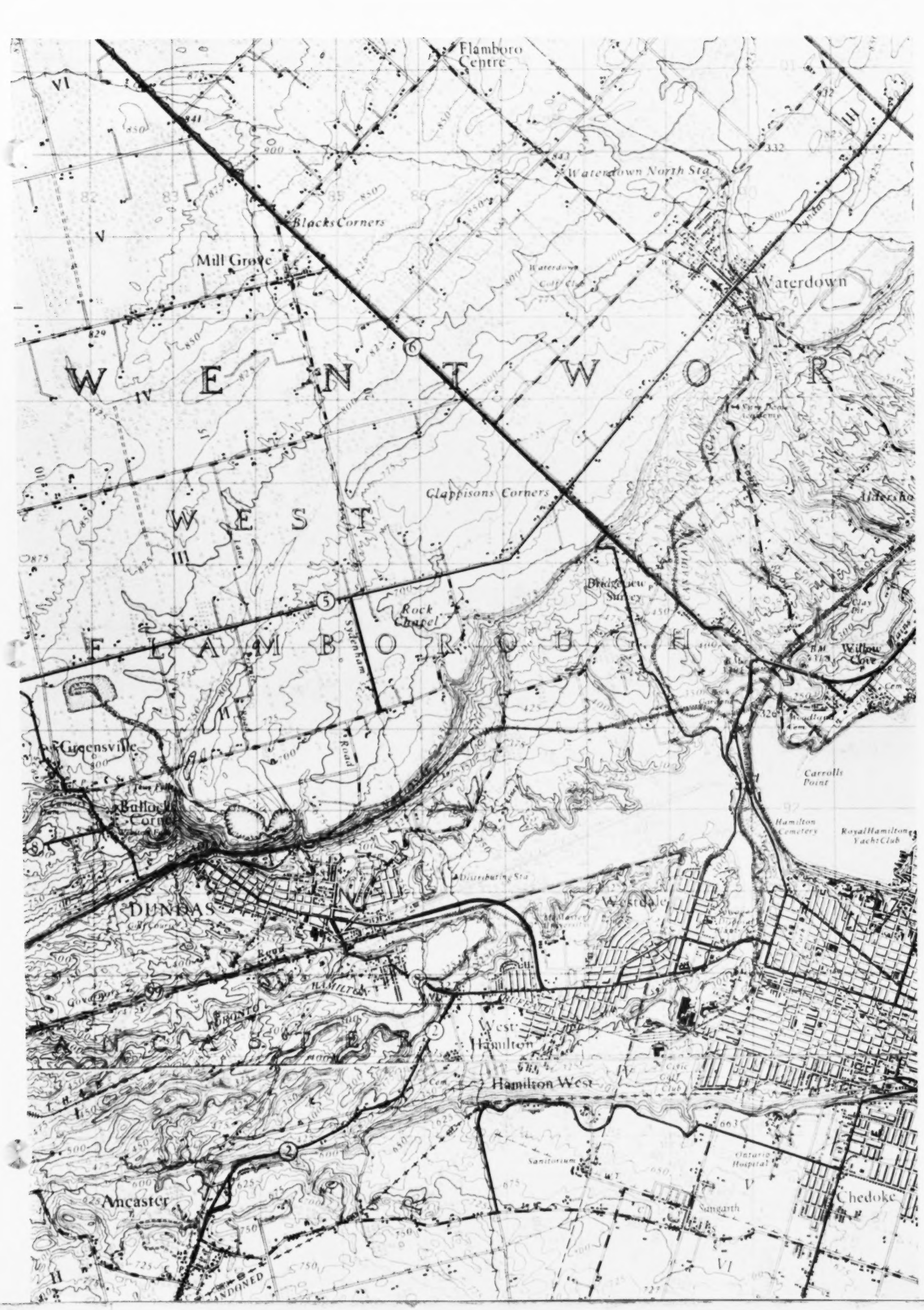
The staff of the centre is in charge of preparing the day's program and instructing the Grade 6 and Special Education classes. The Biology teachers for the Grade 9 and 10 classes are expected to choose a number of the studies for use during the day. The Outdoor staff will act as resource persons and will look after the timetabling of the groups. During each day there will be certain recreational periods set up for the pupils' enjoyment.

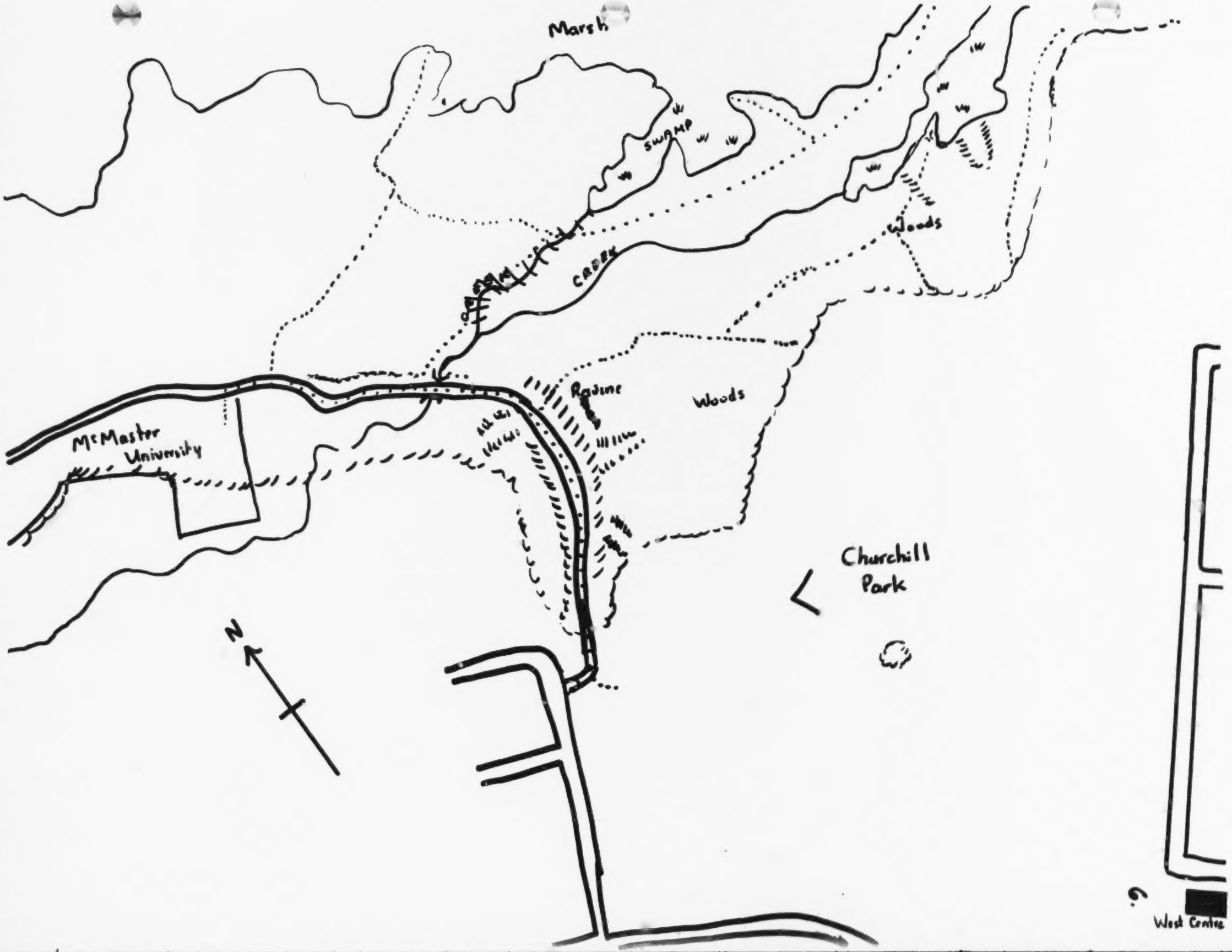
A TYPICAL DAY

9:00 a.m.	Bus leaves home school
9:20 a.m.	Arrival at Outdoor Education Centre
9:20 a.m. - 9:45 a.m.	General instruction period for all students
9:45 a.m.	Morning outdoor activities
11:30 a.m. - 12:00 noon	Return to Outdoor Centre Follow-up session
12:00 noon - 12:30 p.m.	Lunch
12:30 p.m. - 1:00 p.m.	Recreation period
1:00 p.m. - 3:00 p.m.	Afternoon outdoor activities
3:00 p.m. - 3:15 p.m.	Follow-up session
3:15 p.m.	Departure for home school
3:30 p.m. - 3:45 p.m.	Arrival at home school

Port Nelson
Freeman
BURLINGTON
Burlington Beach
LAKE ONTARIO
HAMILTON HARBOUR
Hamilton Beach
HAMILTON
MINISTON
Mount Hamilton
Stoney Creek
Hamilton Airport
Hamilton Water Supply
CANADIAN NATIONAL
CAN NAT
Browns Wharf
Indian Point
Long Acres
Cannery
Pump House
Beacon
Hamilton Beach Road
Van Wagners Beach
340
246
333


T.H. + B. R.R.Y
Grassland
Park
Grassland
Storm Sewer
Woods
Grassland
Orchard
Grassland
Mt. Albion Road
Albion Jr. Vocational School
P
Albright Rd
Red Hill School
X
East Centre
P
Storm Sewer
CREEK
RED HILL
N


Flamboro Centre
Waterdown North Sta.
Blacks Corners
Mill Grove
Waterdown
Glappisons Corners
Rock Chapel
Willow Cove
Carrolls Point
Hamilton Cemetery
Royal Hamilton Yacht Club
Queensville
Bullocks Corners
DUNDAS
Westdale
West Hamilton
Hamilton West
Ancaster
Chedoke
Sanitarium
Ontario Hospital
Sunnyside
ABANDONED
WEST FLAMBOROUGH
WENTWORTH


Marsh
SWAMP
CREEK
Woods
Ravine
Woods
McMaster University
Churchill Park
N
West Centre

TEACHER PREPLANNING FOR THE OUTDOOR EDUCATION CENTRE

In order to make your class's visit to the Outdoor Education Centre a meaningful experience, the staff suggests that the teachers involved in this venture follow the guidelines mentioned below as closely as possible.

BEFORE THE DAY OF THE VISIT

Staff Visit

On the first day of the week preceding your class's visit, a staff member of the Outdoor Education Centre will arrange to visit your class to explain the program to the pupils. Slides of the area will be shown and any questions that you or the students may have will be answered. It is preferable if a room for viewing slides and a screen could be made available for the discussion period with the class. Two student teachers from the Hamilton Teachers' College will probably accompany the Outdoor Education teacher to observe the presentation and assist wherever possible. It would be helpful if the classroom teacher could be freed for ten minutes to discuss the program with the staff member either prior to, or after the class presentation.

Letters, Forms

Following the visit of the staff member, the classroom teacher is asked to distribute to the students the letter from Dr. Price, the information sheet and the consent form.

The consent form should be completed and promptly returned to the classroom teacher. No pupil will be allowed to participate in the program if he has not returned the completed form. These consent forms are to be brought to the Outdoor Education Centre with the class and retained by the classroom teacher for the second trip.

Topic Selection for the Day

It would be of assistance if the classroom teacher would go through the summary of the topics and with the class decide which topics will be studied. This will allow the class to become acquainted with the aims, approach, terminology and some of the skills that might have to be used during their day in the field. The teacher and the class should decide which topics will be taken in order to complete two, two-hour sessions. At the back of this booklet are four option forms, one of which must be completed for each trip and returned to the Science Department, Education Centre, 100 Main Street West one week prior to the class's visit to the Outdoor Centre. The remaining two forms should also be completed and kept for your records. The staff member of the Centre will be able to assist you in completing the form on the day of his visit. They may also be contacted at the following times:

Mondays	1:00 p.m. - 4:00 p.m.	Education Centre.....527-5092, Ext. 373
Tuesdays, Wednesdays	8:45 a.m. - 9:15 a.m. 12:00 noon - 1:00 p.m.	East Centre.....561-9716
Thursdays, Fridays	3:00 p.m. - 3:30 p.m.	West Centre.....522-0793

Grouping

Since all of the field studies are done in small groups, it would facilitate matters if the class was divided into coeducational groups of not more than three pupils each. One of the members of the group should be appointed as the captain or leader, another as the secretary and the third member should be responsible for the equipment.

Behaviour

It is hoped that the classroom teacher would review with the class the fact that this is a school day, in a different locale to be sure, but with the same rules and regulations that apply in their home school.

Lunches

Each pupil is expected to provide his own lunch in a container with his name clearly written on it. Soft drinks may be brought in tin cans with a ring opener. No glass bottles please. Hot drinks or soup could be brought in thermoses in colder weather. It would be helpful if the teacher would discuss the importance of and examples of a good breakfast and lunch prior to the day of the trip.

Clothing

The pupils and the teachers should come prepared to work out-of-doors in all types of weather. Girls should wear slacks or jeans. Boots will be essential whatever the weather or the season. On rainy days pupils should be properly protected. During the winter months the pupils should wear a warm sweater, warm coat, protective headwear, mitts or gloves and a couple of pairs of socks inside their boots.

Equipment

Most of the equipment that the pupils will need is supplied by the Outdoor Centre. The pupils are encouraged to bring cameras, binoculars and compasses with them, if they have them, and if they are willing to assume responsibility for their safekeeping.

NO KNIVES(JACKKNIVES), HATCHETS, MATCHES, CIGARETTES, FIRECRACKERS, RADIOS, WALKIE-TALKIES are to be brought.

Skills

In order that the students can complete their field assignments as easily as possible, some or all of the following skills should be taught or reviewed prior to the date of the visits. Many of the skills needed will depend upon the topics chosen.

The reference books mentioned after some of these skills are available in your school or from the Science Department at the Education Centre (527-5092, Ext. 379).

1. THERMOMETER READINGS AND MEASUREMENT

(a) How to read a thermometer properly
(b) Meaning of a degree
(c) How to hold a thermometer properly

See "Thermometers" -- Pages 3, 9, 16

2. COMPASSES

(a) Parts of the compass
(b) How to hold a compass
(c) Lining up the compass with north
(d) Taking a bearing

See "Compasses" -- Pages 1, 3, 4, 5, 6, 7

3. MEASUREMENT

(a) Proper use of linear measurement
(b) Addition of linear measurements (feet and inches to feet and inches)
(c) Conversion of inches to feet and inches
(d) Meaning of diameter and circumference
(e) Meaning of a square

4. GEOMETRY

(a) Meaning of an angle
(b) Recognizing right angles
(c) Number of degrees in a circle, right angle

5. AVERAGES

(a) How to take the averages of numbers, dimensions

6. FOLLOWING INSTRUCTIONS

(a) This may be the most difficult
(b) Go over the accompanying data sheets with the class

DAY OF THE TRIP

Please check:

☐ 1. Consent Forms

(a) Make sure that these have been received and are complete.
(b) Please bring these with you to the Outdoor Centre.

☐ 2. Groups

(a) Check that all groups are complete.
(b) Make adjustments if necessary.

☐ 3. Lunches

(a) Be certain that names are on lunches.
(b) Drinks are in tin cans or thermoses.
(c) Don't forget your own lunch.

☐ 4. Clothing

(a) Make sure that each pupil is adequately dressed for the day and the weather.
(b) Be properly dressed for being outside yourself.

☐ 5. Pencils

(a) Have two pencils available for each group of three pupils

CLASSROOM TEACHERS ARE REQUESTED

1. To supervise the class on the bus, in the Centre and during the field studies.

2. To provide any necessary discipline.

   NOTE: Any pupil who causes a continual disturbance or who is disobedient will be returned to his school for further discipline by his Principal.

3. To assist the pupils wherever possible in the field study.

4. To assist, if necessary, the student teachers in carrying out the noon hour recreational activities. These will be planned by the student teachers but during the weeks when they are not present, the classroom teacher is expected to assist the staff in providing some form of activity.

5. To collect the data sheets at the end of the study for further use back in the home classroom.

The Board of Education for the City of Hamilton

OFFICE OF THE
DIRECTOR OF EDUCATION

100 MAIN STREET WEST
HAMILTON, ONT.

MAILING ADDRESS
P.O. BOX 556
HAMILTON, ONT.

DEAR PARENT:

Your child's class is to have the opportunity to participate in field studies at one of our two Outdoor Education stations. The east station is located adjacent to the Red Hill Creek Valley while the western station is near the Royal Botanical Gardens natural areas.

These outdoor facilities have been established by the Board of Education in order to enlarge the educational experiences of the children of Hamilton and to enrich the existing curriculum.

The field teaching work will be provided by the regular classroom teacher assisted by two special teachers with a background in Outdoor Education.

The arrangements for the class excursion are attached.

Yours very truly,

GWM/ds
Encl.

Dr. G. E. Price
Director of Education

OUTDOOR EDUCATION CENTRE

THE BOARD OF EDUCATION FOR THE CITY OF HAMILTON

INFORMATION FOR PARENTS

1. Dates of Visit: ..... _____

_____

2. Transportation

A chartered bus will transport the class to and from the home school. Your child should be at school at 8:45 a.m. sharp so that the planned program can begin on time. The bus will return to the home school at approximately 4:00 p.m. There is no charge for the use of this bus.

3. Meals

Each pupil must bring his or her own lunch. Please be sure your child's name is on his lunch parcel.We suggest each child have a good breakfast before leaving home that day. Lunch could include sandwiches, candy bar, something to drink--pop (tin cans only) or a thermos of soup.We prefer pupils not to bring potato chips, popcorn, etc.

4. Clothing

Since this is education in the out-of-doors, your child should be suitably dressed. Girls should wear jeans or slacks. Boots will be a necessity whatever the weather. In the winter pupils should wear a heavy sweater, warm coat, protective head covering, mitts or gloves and a couple of pairs of socks.

5. Consent

It is necessary to have the consent of the parent or guardian before a child may have the opportunity to participate in this program. Would you please fill in the accompanying parents' consent form on health and safety information and return it to your child's teacher. One form will serve for both trips.

6. Supervision

The field trips will be supervised by the home room teacher aided at the Outdoor stations by the two Outdoor Education teachers.

Please detach and return to your teacher

OUTDOOR EDUCATION PROJECT

THE BOARD OF EDUCATION FOR THE CITY OF HAMILTON

HEALTH & SAFETY INFORMATION -- PARENTS' CONSENT FORM

DATES OF FIELD TRIPS: _____ AND _____

(The following information will be helpful in providing the best possible health and safety conditions for your child while at the Outdoor Education station.)

NAME OF CHILD: _____
Last Name First Name

AGE: _____

ADDRESS: _____

PARENT OR GUARDIAN: _____

PHONE: _____

BUSINESS ADDRESS: _____

PHONE: _____

FAMILY DOCTOR: _____

PHONE: _____

Do you know of any allergy or other health factor which will affect your child's participation in the full program? If so, specify.

_____

_____

In the event of an emergency an attempt will be made to contact you and/or your family doctor. If he is unavailable, a local doctor will be called.

I GIVE PERMISSION FOR MY CHILD TO ATTEND.

_____ _____
Signature of Parent or Guardian Date

SUMMARY OF AVAILABLE TOPICS

AUTUMN-SPRING SEASON

A1 Grasslands -- 2 hours (east centre only)

This is a study into the ecological relationships found in a grassy meadowland. The pupils will be involved in collecting data concerning the plants, animals, soil conditions and climatic factors of a selected area (50 foot square). Activities include collecting, measuring and classifying plants and animals.

A2 Woodlands -- 2 hours (both centres)

This study includes a survey of the characteristics of a wooded area. A small selected area is studied as far as classifying and identifying the plants, animals and soils found there. Pupils will attempt to discover the interrelationships between plants, animals, soils and climatic factors.

A3 Marshlands -- 2 hours (west centre only)

This is a study of the plants, animals, soils and climatic conditions found along a transect line from a marshy area on to dry land. Pupils will attempt to discover why certain plants, animals and soils are found where they are.

A4 Ravines -- 2 hours (both centres)

This will be an investigation into the changes which can occur in plants, animals, soils and climatic factors from the bottom of a ravine to the top. Pupils will attempt to account for any changes which may occur.

A5 Contour Mapping -- 2 hours (both centres)

Pupils will have an opportunity to systematically and accurately make a contour map of a hill or ravine and to plot this on graph paper for subsequent model making.

A6 Walk in the Woods -- 1 hour (both centres)

This is a general survey walk to acquaint the pupils with the things of nature about them and to acquire an appreciation of the out-of-doors. Pupils will be introduced to problems of disease, erosion, conservation, pollution and man's influence on the area. Other areas included are bird watching, geological history, local history.

A7 Compass-Orienteering -- 1 hour (both centres)

Pupils are instructed in the proper use of a compass. They are then given an orienteering exercise of finding their way around a specified area using only a compass.

A8 Art Appreciation -- 1 hour (both centres)

This will be an opportunity for the pupils to individually participate in sketching out-of-doors, creative designing and creative writing.

A9 Land Use Survey -- 1 hour (both centres)

This will attempt to study the characteristics of the soil and to determine how it could be best used.

A10 Stream Study -- 2 hours (both centres)

This is a survey of a stream to determine its characteristics, size, temperature, rate of flow, and its influence upon the surrounding land. A study will be made of the surrounding plants and climatic conditions. This study will require the pupils to work in and around the stream so boots for everyone will be imperative.

A11 Moss Distribution Survey -- 2 hours (west centre only)

This is a simple survey to determine if mosses grow only on the north sides of trees and to discover the conditions for their growth.

WINTER SEASON ONLY (DECEMBER 1 TO APRIL 15)

B1 Woodlot Survey -- 2 hours (both centres)

This is a survey of the trees growing within a one acre woodlot to determine the height, diameter, circumference of trees and to estimate the amount of logs and lumber found in the trees. A cost is estimated to ascertain the value of the woodlot. This is mainly a mathematical and measurement exercise.

B2 Moss Distribution Survey -- 2 hours (west centre only)

This is a simple survey to determine if mosses grow only on north sides of trees and to discover the conditions for its growth.

B3 Grassland to Woodland -- 2 hours (both centres)

This study is to discover the changes in snow, temperatures, winds, wind chill factors and animal life found along a transect line from an open grassland into a woodland and to try and interrelate the findings.

B4 Marshland in the Winter -- 2 hours (west centre only--conditions permitting)

This is a study through a hole in the ice of the marsh to discover the characteristics of the water, ice, animal life and climate in and around a marshland.

B5 Animals in Winter -- 2 hours (both centres)

This study is to observe and record all possible signs of animal life within the area. This will include sketching, measuring, identifying these signs. Plaster casts could be made of animal tracks if conditions are right.

B6 Walk in the Woods -- 1 hour (both centres)

This is a general survey walk of the area to acquaint the pupils with the things of nature about them and to acquire an appreciation of the out-of-doors. Pupils will be introduced to problems of disease, erosion, conservation, pollution and man's influence on the area. Other areas included are bird watching, geological history and local history.

B7 Compass-Orienteering -- 1 hour (both centres)

Pupils are instructed in the proper use of a compass. They are given an orienteering exercise of finding their way around a specified area using only a compass.

B8 Contour Mapping -- 2 hours (both centres)

Pupils will have an opportunity to systematically and accurately make a contour map of a hill or ravine and to plot this on graph paper for subsequent model making.

B9 Trees in Winter -- 1 hour (both centres)

This study is to show pupils how they can learn to identify some common deciduous trees according to the shape, bark and winter buds of the tree. Pupils will also learn how to use a simple key to identify other twigs.

B10 Gall Survey -- 1 hour (east centre only)

This is a simple study to determine the location and population of the gall found on goldenrod plants

A1

PLANT STUDY

Grassland

Square _____

OUTDOOR EDUCATION INSTRUCTION SHEET

DATE _____

YOUR SCHOOL _____

NAMES _____

_____

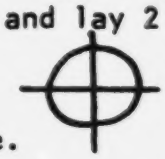
_____

Purpose: To investigate and discover the types of plant growth found in a selected area of grassland.

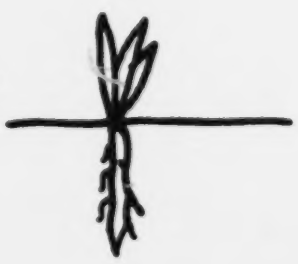
Equipment: clipboard, pencils, 4 corner posts, 1 hoop, 2 yardsticks, 18 inch ruler, hammer, trowel.

Instructions:

1. Set up a square area, 50 ft. on each side and stake a post in at each corner.
2. Toss a hoop to land in an as average an area as you can somewhere within this square area. Where the hoop lands, move it so it rests on the ground and lay 2 yardsticks across it like this:



3. Repeat the sampling at least twice.
4. Examining the area within the hoop carry out the following studies:
   (a) Plant Types -- Locate the different types of plants and either name them or give each a letter.
   (b) Map -- On the back of the data sheet draw a circle to show the hoop. Locate each of the different plant types in the hoop using a different symbol for each plant type.
   (c) Number of Plants -- Count how many plants there are of each type.
   (d) Plant Height -- Measure several plants of each type and work out an average height for each plant type.
5. Carefully dig up an example of each plant type and examine it for the following features. (Replace it back in the ground when you are finished.)
   (a) Root type

Name	Tap	Fibrous
		

Instructions: (Continued) 5. (b) Root Length -- Measure from the ground to the longest root tip.

(c) Stem Type -- Woody or fleshy (usually green, (easily bent)

(d) Leaf Type

Simple

Compound

(e) Leaf Shape

Circular

Oval

Elliptical

Egg

Lance

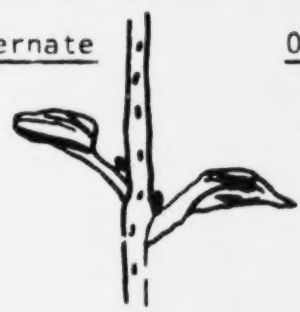
Triangular

Diamond

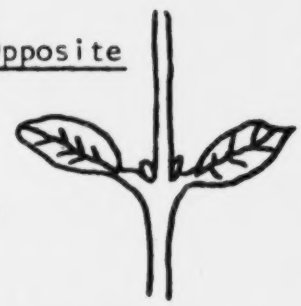
Heart

(f) Leaf Arrangement

Alternate



Opposite



Whorled

(g) Flower -- Count the number of flowers on each plant type and describe them.

(h) Seeds -- Describe the seeds, if present, and how they are released and adapted for carrying from place to place.

PLANT STUDY DATA SHEET

GRASSLAND

Sample Number	Plant Type Name	No. of each type	Average Height of Each Type	Root Type	Root Length	Stem Type	Leaf Type	Leaf Shape	Leaf Arrangement	Flowers Description	Number of Flowers	Sketch	Seed Description	Sketch of Seeds	
1															
2															
3															
4															
5															
6															
7															
8															

SOIL STUDIES

OUTDOOR EDUCATION INSTRUCTION SHEET

Grasslands

DATE _____

Square _____

YOUR SCHOOL _____

NAMES _____

_____

_____

Purpose: To discover the characteristics of soils.

Equipment: clipboard, pencils, 1 hoop, Ph paper booklet, bottle of distilled water, trowel, open-ended tin can, container of water, red wooden peg, hammer, soil sieve box, 18 inch ruler, 1 empty tin can.

Instructions:

1. At one of the marked out 50 ft. squares, toss out the hoop into the area, trying to avoid other groups and carry out the following studies. When one area has been completed, toss the hoop out again and repeat the investigations.

(a) Soil Texture -- Moisten a small sample of soil in the palm of your hand and rub the moist soil between the thumb and finger. Observe whether the soil is gritty, smooth or sticky.

(b) Soil Type -- Note if the soil is granular (clay), sandy or loam.

(c) Ph Factor -- Using a trowel cut a slit into the soil. Tear off 1 Ph Paper from the booklet standing it upright in the slit. Pack the soil around the paper so that some of it is exposed. Pour a little distilled water around the paper. After a few minutes, remove the paper and match its colour with the colour guide inside the booklet. Note the Ph Number on the chart:

1-6 = acid or sour soil
7 = neutral soil
8-14 = alkaline or sweet soil

(d) Soil Porosity -- Push the end of the open tin can into the ground about 1/4 inch. Measure out a quantity of water into another container and pour it into the can. Count the length of time it takes for the water to drain away beginning at the time the water is first poured.

(e) Soil Hardness -- Place the red wooden peg in the ground and hit it with equal weighted strokes with the hammer about 5 times. Measure how deep the peg went into the ground. Do this 3 times at each location and take an average depth.

(f) Particle Size -- Pour 2 trowelfuls of dry soil into the top of the soil sieve box. Shake the box at least 30 shakes from side to side until the soil stops dropping in the box. Take out each layer and see where the different particles are and where most of the particles would be. Measure the size of particle at each level and estimate how many particles are at each level.

(g) Soil Colour -- Note the colour of the soil at the surface.

SOIL STUDY DATA SHEET

GRASSLAND

Sample No.	Soil Texture	Soil Type	Ph Factor	Soil Porosity	Soil Hardness	Particle Size			Soil Colour
						Tray No.	No. of Particles	Size	
Example	Sticky	Clay	Ph 6	1 minute 20 seconds	2 inches	1 2 3 4 5 6	4 20 40 200 many many	1/2" 1/8" 1/16" 1/32" dust dust	Light Brown
1									
2									
3									
4									
5									
6									
7									

CLIMATIC STUDY

OUTDOOR EDUCATION INSTRUCTION SHEET

Grassland

Square _____

DATE _____

YOUR SCHOOL _____

NAMES _____

_____

_____

Purpose: To discover some of the conditions of the area climate.

Equipment: 2 thermometers, yardstick, 1 soil thermometer, 1 sling psychrometer, 1 plastic bottle of water, 1 relative humidity guide, timing device, light meter, compass, 1 weather vane, 1 wooden stand, clipboard, pencils.

Instructions: Using the centre of the area and the corners of the area, carry out the following studies:

1. Air Temperature -- Using the thermometer hold it at the surface of the ground. Record the temperature. Raise the thermometer up 12 inches and take the temperature there. Repeat up to a height of 5 ft. Allow about 2 minutes for the mercury to change at each level. Always keep the thermometer in its case when you are not using it.

2. Soil Temperature -- Measure 1" on the thermometer and insert it into the ground to this depth. Leave the thermometer there until the needle stops moving and record the temperature. Now measure 2" on the thermometer and push it into the ground to get the temperature. Repeat up to a depth of 6".

3. Relative Humidity -- Wet the cotton piece with water and twirl the psychrometer around for at least 1 minute at about 3 feet above the ground level. Record the temperature of the wet and dry bulb. Find the temperature difference and calculate the amount of moisture in the air as a percentage.

4. Light Intensity -- Using the light meter, record the number of footcandles of light when the instrument is placed on the ground and at a height of 3 ft.

5. Wind Direction -- Set up the stand in the selected area and place a wind vane on top with a compass beside it. Line up the compass needle with the N or the compass card. Stand back and observe the general direction from which the wind is blowing.

CLIMATE STUDY DATA SHEET

GRASSLANDS

Location	Air Temperature Height						Soil Temperature Depth						Relative Humidity				Light Intensity (footcandles)		Wind Direction
	Ground	1 foot	2 foot	3 foot	4 foot	5 foot	1 in.	2 in.	3 in.	4 in.	5 in.	6 in.	Dry Bulb	Wet Bulb	Difference	%	Ground	3 ft. High	
Ex.	60°	60°	61°	61°	61°	62°	60°	59°	59°	58°	57°	56°	60	55	5	73	40	60	N.E.
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			

TABLE FOR FINDING RELATIVE HUMIDITY IN PERCENTAGES

Temperature Reading of dry-bulb thermometer	Difference in degrees Fahrenheit between wet - and dry-bulb thermometers															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
60	100%	94%	89%	84%	78%	73%	68%	63%	58%	53%	49%	44%	40%	35%	31%	27%
61	100	94	89	84	79	74	68	64	59	54	50	45	40	36	32	28
62	100	94	89	84	79	74	69	64	60	55	50	46	41	37	33	29
63	100	95	90	84	79	74	70	65	60	56	51	47	42	38	34	30
64	100	95	90	85	79	75	70	66	61	56	52	48	43	39	35	31
65	100	95	90	85	80	75	70	66	62	57	53	48	44	40	36	32
66	100	95	90	85	80	76	71	66	62	58	53	49	45	41	37	33
67	100	95	90	85	80	76	71	67	62	58	54	50	46	42	38	34
68	100	95	90	85	81	76	72	67	63	59	55	51	47	43	39	35
69	100	95	90	86	81	77	72	68	64	59	55	51	47	44	40	36
70	100	95	90	86	81	77	72	68	64	60	56	52	48	44	40	37
71	100	95	90	86	82	77	73	69	64	60	56	53	49	45	41	38
72	100	95	91	86	82	78	73	69	65	61	57	53	49	46	42	39
73	100	95	91	86	82	78	73	69	65	61	58	54	50	46	43	40
74	100	95	91	86	82	78	74	70	66	62	58	54	51	47	44	40
75	100	96	91	87	82	78	74	70	66	63	59	55	51	48	44	41
76	100	96	91	87	83	78	74	70	67	63	59	55	52	48	45	42
77	100	96	91	87	83	79	75	71	67	63	60	56	52	49	46	42
78	100	96	91	87	83	79	75	71	67	64	60	57	53	50	46	43
79	100	96	91	87	83	79	75	71	68	64	60	57	54	50	47	44
80	100	96	91	87	83	79	76	72	68	64	61	57	54	51	47	44
82	100	96	92	88	84	80	76	72	69	65	61	58	55	51	48	45
84	100	96	92	88	84	80	76	73	69	66	62	59	56	52	49	46
86	100	96	92	88	84	81	77	73	70	66	63	60	57	53	50	47
88	100	96	92	88	85	81	77	74	70	67	64	61	57	54	51	48
90	100	96	92	89	85	81	78	74	71	68	65	61	58	55	52	49
92	100	96	92	89	85	82	78	75	72	68	65	62	59	56	53	50
94	100	96	93	89	85	82	79	75	72	69	66	63	60	57	54	51
96	100	96	93	89	86	82	79	76	73	69	66	63	61	58	55	52

ANIMAL STUDY

OUTDOOR EDUCATION INSTRUCTION SHEET

Grassland

Square _____

DATE _____

YOUR SCHOOL _____

NAMES _____

_____

_____

Purpose: To study the types, characteristics and locations of animal life within a 50 ft. square area of grassland.

Equipment: trowel, hand magnifier, 18 inch ruler, plastic vials, clipboard, pencils, aspirators, insect nets

Instructions:

1. Remember that an animal is any living thing which is: (a) able to move; (b) reproduces by eggs or live birth (usually); breathes oxygen from air or water; (c) eats food rather than produces it.
2. Using the 50 foot square area which has been set out and trying to avoid interfering with other groups, examine the entire area for signs of animal life.

LARGE ANIMALS

3. Note any large animal seen (mammal, bird, reptile, amphibian). Record its colour, size (approximate), number of each type of animal.
   Look for signs of animal activity such as animal runways, food cuttings, gnawings, clawmarks, footprints, nests, tunnels, holes, animal droppings.

SMALL ANIMALS

4. Note smaller animals (insects—moths, butterflies, ants; spiders; snails; worms, etc.) seen. Be sure to look over the entire area. Some may be found by removing the top three or four inches of soil with the trowel and carefully sifting through it. Look under rocks, logs, but be sure to put these objects back exactly the way you found them.

   Using the insect nets sweep across the plants and try to catch some of the insects which might be found there.

   Use the aspirator to catch some of the small insects which might be on the ground.

5. Sketch each animal type seen. Note the colour, number of body parts, number of legs, evidence of wings and the location within the area where the animal was found.

ANIMAL STUDY DATA SHEET

GRASSLAND

Animal Found	Location Where Found	No. of Animals Seen	Length	Colour	No. of Body Parts	No. of Legs	Wings	Evidences of Animals	Location of Animal Signs	Sketch of Animal Sign	What animal do you think made this sign?
Bee	In the air	2	1/2"	yellow black	3	6	4	droppings	grass	● 1/4 inch long	rabbit

A2

WOODLAND STUDY

OUTDOOR EDUCATION INSTRUCTION SHEET

Square _____

DATE _____

YOUR SCHOOL _____

NAMES _____

_____

_____

Part A

Equipment: clipboard, pencils, 2 compasses

Instructions: 1. Go with the instructor to the woodland area and with your partners answer the following questions. When completed return to your square plot and map it.

Questions: Make your answers as full as you can and in good English. The place in which you are going to study is the home of different plants or animals and this is called the "Habitat".

1. What is the 'aspect' of the habitat? (This means does it face North or South or in another direction?)

2. Is the habitat on a slope, and if so is it steep or gradual or between the two? (If you can give some idea of the slope do so.)

3. Are there any gardens near from which plants could escape? If so, could they be blown as seeds? Is this ground ever used as a rubbish dump? What proof can you find?

4. What paths are there in the wood, and if any, are they used by people and their pets? What clues can you find to prove this?

5. Is this woodland completely wild or is it some times cleared and even replanted? Can you discover when anything like this was last done?

6. In the woodland is the soil usually wet or dry? What is the general ground covering? What particular type of plant creates this covering?

7. Is there any evidence of the age of the trees (from scars, natural or otherwise or other means)? Draw pictures of some of these signs.

8. Are there old and young trees and seedlings of all the species present? What different types of trees can you find?

9. Are there evidences of new trees sprouting among the older trees? (Multiple stems are a good indication that trees have developed as sprouts from stumps.) Draw a sketch to show some of these sproutings.

10. What happens to trees when they get old? Are they cut down or do they die? Are any cut down before they have a chance to get old? What evidence can you find in this woodland?

11. What evidence is there to suggest whether the trees are planted or 'wild'?

12. What are all these trees trying to do?

13. What happens to the leaves, flowers, seeds, dead wood, etc., that are forever being produced?

14. How has man made use of this area? How has it been misused?

15. What do you think this area will look like in 20 years?

16. Do the tall branches meet overhead, forming a 'closed' wood or is the wood 'open'?

17. What size of plant life seems to be in the greatest number -- trees, shrubs, ground plants?

18. What types of animals live in this habitat that you can see?

1. Map: On the bottom of this page draw a map of the selected area as it would appear if you were looking straight down on it. Locate each tree, shrub, plant, stones, etc. exactly in the correct location. Use symbols to represent these objects. For example:

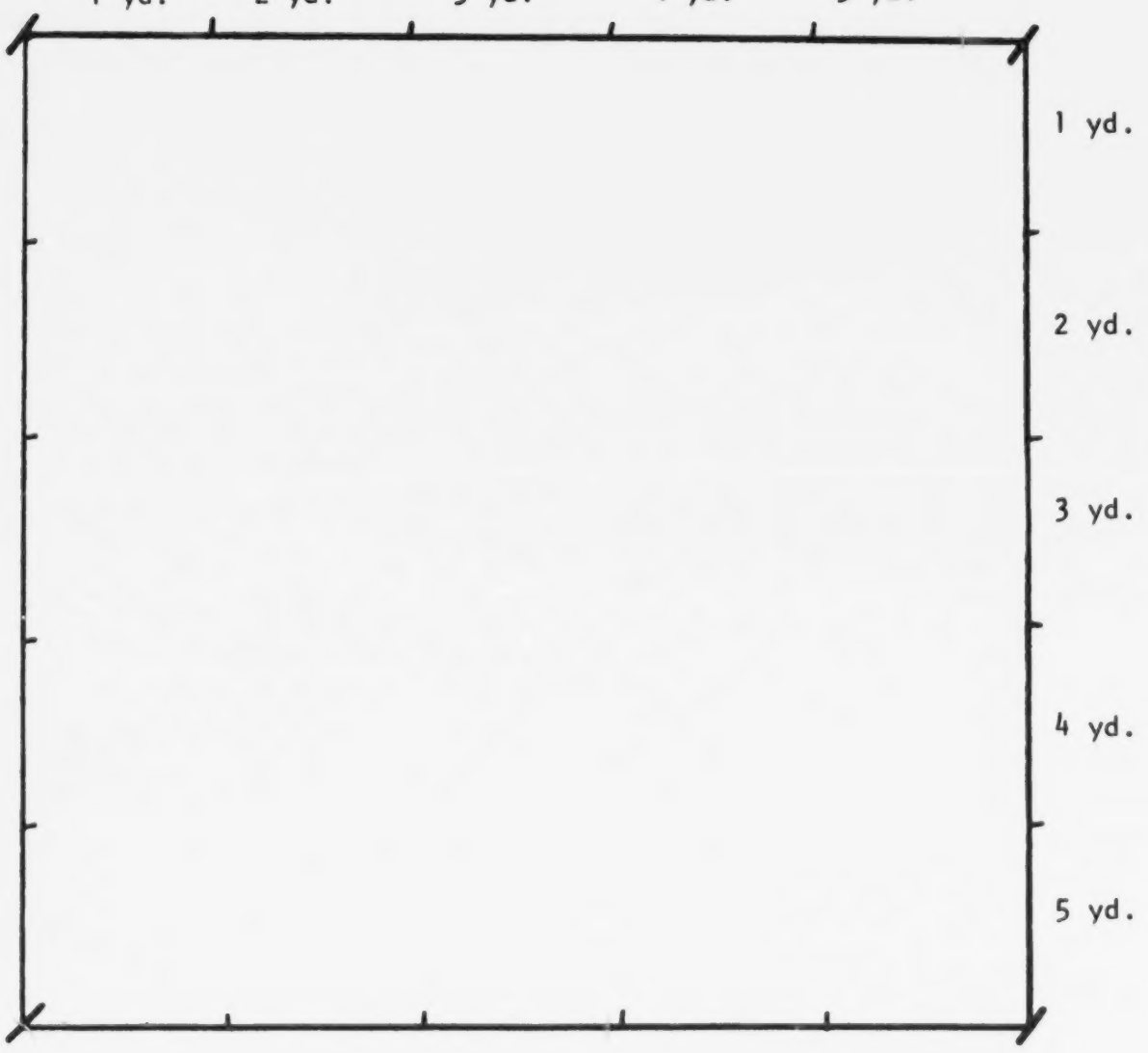
x = a tree

s = a plant, shrub

p = a small plant

z = stones

= sticks, branches



A.2

WOODLAND STUDY

OUTDOOR EDUCATION INSTRUCTION SHEET

Square _____

DATE _____

YOUR SCHOOL _____

NAMES _____

_____

_____

Part B

Equipment: clipboard, pencils, trowel, 2 yardsticks, 1 - 18" ruler, Ph Paper, bottle of distilled water, soil auger, 1 glass thermometer, 1 soil thermometer

1. Within the selected area carry out the following studies and put your information on the following data sheets. Do each study at each corner of the square and at the centre of the area.

   (a) Animal Study -- In the area note all the various forms of animal life that you can see. Note where these animals were found such as in trees, shrubs, on the ground, under the forest litter, under logs, rocks, etc.

   (b) Soils -- In the selected area note the COLOUR of the soil.

   Texture -- Moisten a small sample of soil in the palm of your hand and rub the moist soil between the thumb and finger. Observe whether the soil is gritty, smooth or sticky.

   Depth of Litter -- Using the ruler, measure how deep the ground is covered with fallen leaves, decayed material. How many years of litter can you find in your area?

   Ph Factor -- Using a trowel cut a slit into the soil. Tear off one Ph paper from the booklet standing it upright in the slit. Pack the soil around the paper so that some of it is exposed. Pour a little distilled water around the paper. After a few minutes, remove the paper and match its colour with the colour guide inside the booklet. Note the Ph number on the chart:

   1-6 = acid or sour soil
   7 = neutral soil
   8-14 = alkaline or sweet soil

   Soil Profile -- At thecentre and the corners of your area take the soil auger and drill a hole as deep as you can. Pull out the auger and look at the soil core. Measure how deep each layer is and note the colours of the various layers of the soil.

   (c) Air Temperature -- Using the thermometer take the temperature of the air at various heights and at different locations in the selected area. Hold the thermometer at each level for at least two minutes to allow the mercury to settle.

(d) Soil Temperature -- Measure 1" on the thermometer and insert it into the ground to this depth. Leave the thermometer there until the needle stops moving and record the temperature. Now measure 2" on the thermometer and push it into the ground to get the temperature. Repeat up to a depth of 6 inches.

WOODLAND STUDY DATA

Location No.	Animal Seen	Location of Animal	Soil Colour	Soil Texture	Depth of Forest Litter	Ph Factor	Soil Profile	Air Temperature Height						Soil Temperature Depth					
								Surface	1 ft.	2 ft.	3 ft.	4 ft.	5 ft.	1"	2"	3"	4"	5"	6"
Example	ant spider sparrow worm	soil branch branch soil	light brown	gritty	1 inch	5 (sour)	top- dark brown 1 inch middle- light brown 4 inches bottom- tan brown 5 inches	60°	60°	59°	58°	57°	56°	59°	59°	58°	57°	57°	56°
1																			
2																			
3																			
4																			
5																			

A2

WOODLAND STUDY

OUTDOOR EDUCATION INSTRUCTION SHEET

Square _____

DATE _____

YOUR SCHOOL _____

NAMES _____

_____

_____

Part C

Equipment: clipboard, pencils, tree calipers, yardstick, tape measure, crayon

1. In the selected area, pick out three different types of trees and collect the following information:

   (a) Tree Height -- Using one of the methods given to you by the instructor calculate the height of each of these trees.

   (b) Tree Circumference -- Using a tape measure, stretch it around each of the trunks of trees to find the distance around.

   (c) Tree Diameter -- Using the tree calipers measure the distance through the centre of the tree trunk. Do this from two sides of the tree and take the average distance.

   (d) Tree Bark -- Draw a picture of the bark of each tree on the back of the data sheet using the crayon. Number your picture.

   (e) Tree Name -- If known, if not, give the tree a letter.

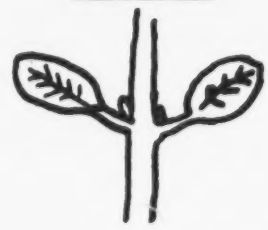
   (f) Colour of Bark

   (g) Seeds -- Look for examples of seeds on or below the tree and describe them.

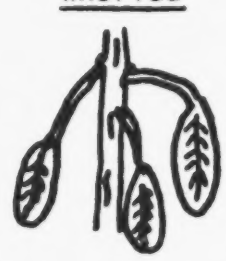
   (h) Seed Size -- Measure the length of the seeds.
   -- Note how these seeds are spread from the trees.

   (i) Leaf Arrangement -- Alternate

Opposite



Whorled



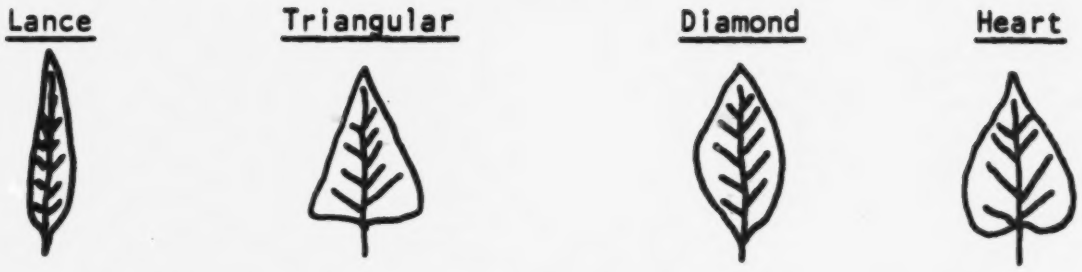
   (j) Leaf Shape -- Circular

Oval

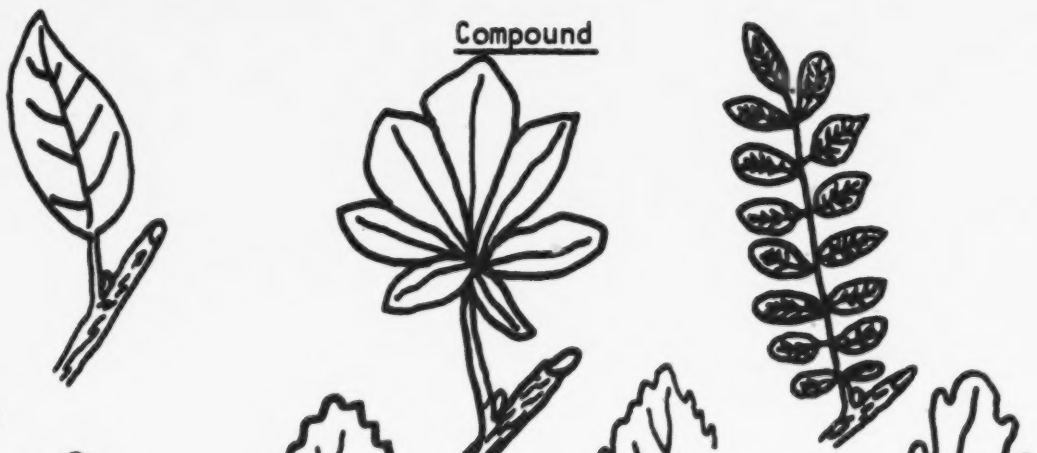
Elliptical

Egg

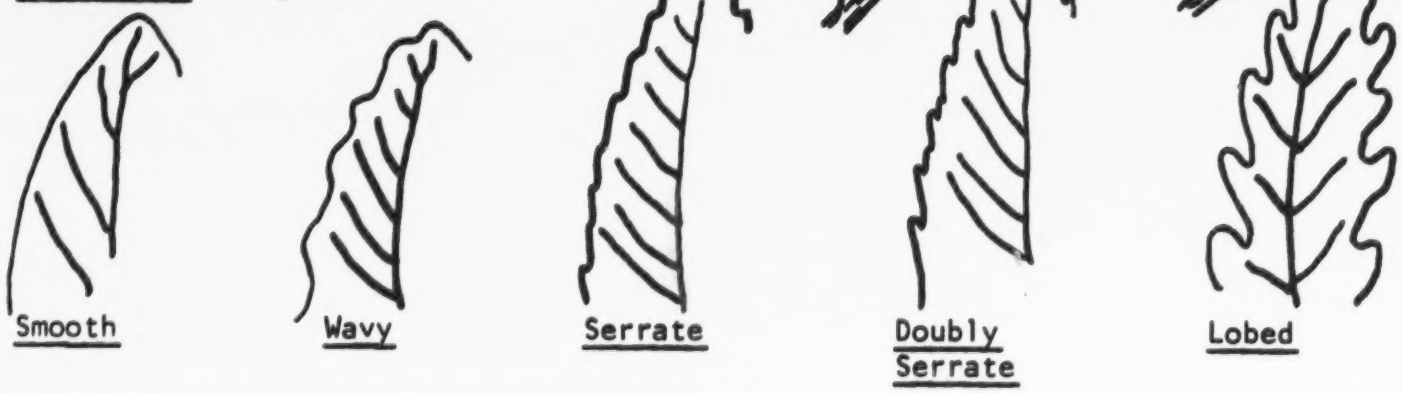
(j) Leaf Shape (Continued)



(k) Leaf Type -- Simple



(l) Leaf Edges (Margins)



(m) Animal Life -- Look in the bark of the tree to see if there are any insects there. Note the type of animal found there.

2. In the selected area pick out 3 different types of shrubs and collect the following information about these shrubs:

   (a) Shrub Height

   (b) Shrub Diameter -- Measure the distance through the shrub from one side to the other.

   (c) Shrub Name -- Identify the shrub if you can, if not give it a letter.

   (d) Leaf Type -- Same as part (k) above.

   (e) Leaf Arrangement -- Same as part (i) above.

   (f) Leaf Edge -- Same as part (l) above.

   (g) Leaf Shape -- Same as part (j) above

   (h) Seeds -- Describe the seeds if present on or around the shrub.

   (i) Flowers -- Describe the flowers, if present, on the shrub.

3. In the selected area pick out 3 different types of low plants and collect the following information about these plants:

   (a) Name of Plant -- If known, otherwise give it a letter.

   (b) Height of Plant -- Measure it with a yardstick.

   (c) Number of Plants -- Either count or estimate how many plants there are of each of the types that you selected in the marked off area.

WOODLAND STUDY DATA SHEET

3	2	1	Sample
			Tree Name
			Tree Height
			Tree Circumference
			Tree Diameter
			Bark
			Colour of Bark
			Seeds Description
			Seed Size
			Leaf Arrangement
			Leaf Shape
			Leaf Type
			Leaf Edge
			Animal Life
			Shrub Name
			Shrub Height
			Shrub Diameter
			Leaf Type
			Leaf Arrangement
			Leaf Edge
			Leaf Shape
			Seeds
			Flowers
			Small Plant Name
			Height
			Number of Plants

A3

PLANT STUDY

OUTDOOR EDUCATION CENTRE

DATE _____

Marshland

YOUR SCHOOL _____

Transect Line _____

NAMES _____

_____

_____

Purpose: To study the types and characteristics of plant growth in the water and some of the conditions of their environment.

Equipment: yardstick, clipboard, pencils, 50 ft. transect line, 5 plastic vials, hammer.

Instructions:

1. Assist the other plant study group in setting out the other end of the 50 ft. transect line, 25 ft. out into the marsh area (if possible).

2. At each 3 foot(1 metre) interval along the transect line starting from the shore stake, carry out the following studies:

(a) Vertical Distance -- Measure the exact distance (up and down) from the mark on the line to the water level and then the distance from the line to the water bottom.

(b) Mud Depth -- at each location push a yardstick into the mud bottom and see how far the mud layer is.

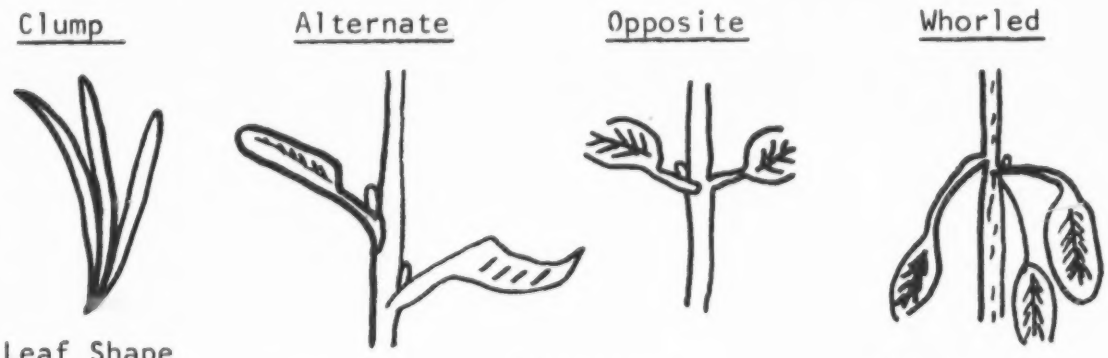
(c) At each location observe and note down the following facts about the plant life found there:

Plant Name -- if known, otherwise give it a letter
-- draw a sketch of the plant

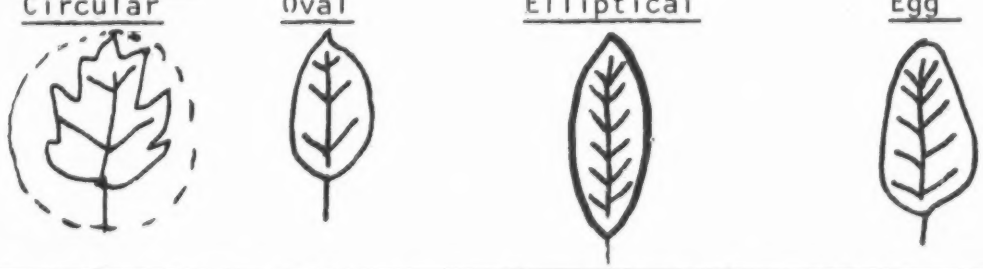
(d) Plant Height -- from the topto the bottom of the plant

(e) Pattern of distribution -- single, clumped, sparse, thick

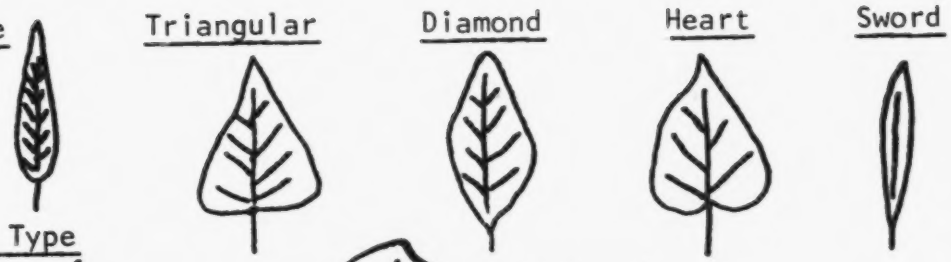
(f) Leaf Arrangement --



(g) Leaf Shape

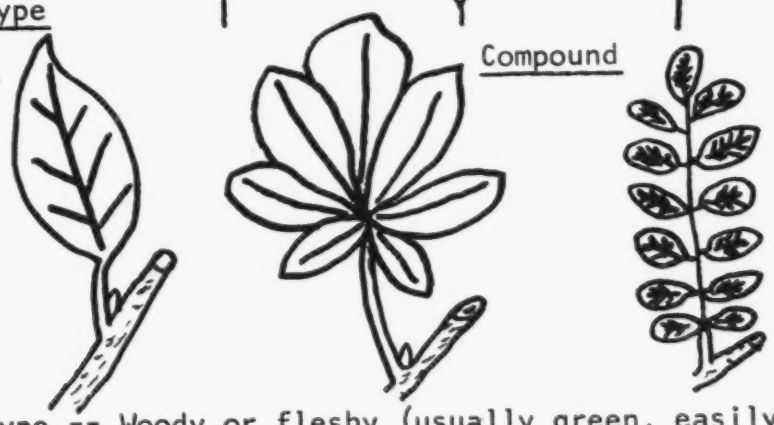


(g) Lance Triangular Diamond Heart Sword



(h) Leaf Type

Simple Compound



(i) Stem Type -- Woody or fleshy (usually green, easily bent)

(j) Roots -- Note location of the roots, whether they are floating or secured in the mud bottom

(k) Flowers -- Note if any were evident, if they were alive or dead
-- Describe the flower as to colour, unusual features

(l) Seeds -- Note if any were evident and describe them
-- You may put a sample of the seed into a plastic vial noting the location and plant from where you got the sample.

Enter all your information on the following data sheets. Be sure to fill in the correct number of your locations.

					Location
					Vertical Distance
					Plant Name
					Sketch of Plant
					Height of Plant
					Pattern of Distribution (name)
					Leaf Shape
					Leaf Arrangement
					Leaf Type
					Stem Type
					Root Type
					Root Length
					Flower
					Seeds

PLANT STUDY

A3

ANIMAL LIFE IN THE WATER (MUD)

OUTDOOR EDUCATION CENTRE

Marshland

AREA _____

DATE _____

YOUR SCHOOL _____

NAMES _____

_____

_____

Purpose: To study the types, characteristics and location of animals found in a marshland area.

Equipment: dip net, 12 plastic vials, masking tape, plastic pail, 3 kitchen strainers, 2 insect nets, 1 18 inch ruler, clipboard, pencils, 3 aluminum pie plates.

Instructions:

1. Working in the area between the 2 transect lines and in the water area carry out the following studies of animal life. Be sure to remove only ONE EXAMPLE of any animal type.

2. Collect a sample of water near the shore, partway out and about 25 feet out to get samples of small microscopic life in the water from different areas. Keep these samples in pill vials and take them back to the centre to examine under the microscope.

3. Using the insect nets sweep across the plants in the water and try to catch the insects flying there. Note the size, colour, number of body parts, legs, wings and name of the insects caught. Draw a picture of the animal caught and then let it go.

4. Using the dip nets and the kitchen strainers collect animal life which is found on the surface of the water and in the water. Note the location, size, name, body parts, legs, wings of those creatures caught. Place some of the samples of water animals in the aluminum pie plates in order to look at them more closely.

   NOTE: Draw the sketches of animals seen on the back of the data sheet.

5. Remember that an animal is any living thing which is:

   (a) able to move
   (b) reproduces by eggs or live birth (usually)
   (c) breathes oxygen from air or water
   (d) eats food rather than produces it

6. Secure one end of the transect line to the shore pole of the plant study group and stretch the line out for a distance of 50 ft. parallel to the shoreline. Examine the area between these lines and the shoreline for signs of animal life.

Large Animals

7. Note any large animal seen (mammal, bird, reptile, amphibian). Record its colour, size (approximate), habitat (where found), special features, numbers of each type of animal. Look for signs of animal activity such as animal runways, food cuttings, gnawings, claw marks, footprints, nests, tunnels, holes, animal droppings.

Small Animals

8. (a) Note small animals (insects--moths, butterflies, ants, spiders, snails, worms, etc.). There will be so many of these that you will be able to record only some. Be sure to look over the entire area. Some may be found by removing the top three or four inches of soil with the trowel and carefully sifting through it. Look under rocks, logs, but be sure to put these objects back exactly where you found them.

   (b) Sketch each animal type that is seen. Note the colour, number of body parts, number of legs, evidence of wings, and the location within the area where the animal was found.

ANIMAL STUDY IN THE MARSHLAND

In the Air							
Animal Name	Where Found	Number Found	Length	Colour	Body Parts	Legs	Wings

On the Water							
Animal Name	Where Found	Number Found	Length	Colour	Body Parts	Legs	Wings

In the Water (Mud)							
Animal Name	Where Found	Number Found	Length	Colour	Body Parts	Legs	Wings

On Land Near the Marsh

LARGE ANIMAL DATA

	Animal Seen
	Location Where Seen
	Size (approximate)
	Colour
	Number Found
	Special Features
	Evidence of Animals
	Location of Animal Signs
	Sketch of Animal Sign
	Size of Animal Sign
	What is the Animal Which Made the Sign?

A3

CLIMATIC STUDY
MAP MAKING

Marshland

Transect Line _____

OUTDOOR EDUCATION INSTRUCTION SHEET

DATE _____

YOUR SCHOOL _____

NAMES _____

_____

_____

Purpose: To discover some of the conditions of climate and water conditions and how they influence the animal and plant life of the area. To make a general overview map of the transect area.

Equipment: 2 thermometers, 1 maximum--minimum thermometer, yardstick, 1 sling psychrometer, container of water, 1 relative humidity guide, timing device, 2 compasses, clipboard, pencils, soil thermometer

Instructions:

1. Select one of the transect areas at which to work.

2. At each 3 foot interval on the transect line, starting at location 1 carry out the following studies:

(a) Air Temperature -- Using the thermometer, hold the bulb at the surface of the ground. Record the temperature. Raise the thermometer to 12 inches above the surface and after allowing 2 minutes for the mercury to change, read the temperature. Repeat for each foot higher until the transect line is reached.

(b) Measure 1" up from the end of the thermometer and push it into the ground to this depth. Leave the thermometer in the soil until the needle stops moving. Press the thermometer to a depth of 2" and record the temperature. Repeat to a depth of 6".

ALWAYS KEEP THE THERMOMETER IN ITS CASE WHEN YOU ARE NOT USING IT.

(c) Water Temperature -- Using the maximum--minimum thermometer adjust the metal slide inside with the magnet so that it is against the mercury. Hold the thermometer at the surface, and at the selected depths (see data sheet) and observe the temperature. Readjust the metal slide after each temperature reading. The thermometer should remain at each location for at least 2 minutes before taking a reading.

(d) Relative Humidity -- Wet the cotton piece with water and twirl the psychrometer around for at least 1 minute at about 3 feet above the ground level. Record the temperatures of the wet bulb and dry bulb thermometers, note the difference in temperatures and calculate the amount of moisture in the air as a percentage.

(e) Light Intensity (on land only) -- Using the light meter, record the number of footcandles of light when the instrument is placed on the ground and above the highest plant, other than shrubs, saplings or trees.

(f) Map -- On the back of the data sheet, draw a view of the valley in the area where the transect line is located. Include the area 25 feet on each side of the line. Note exactly the location of all trees, shrubs, saplings, areas of plant growth, stones, logs, water, etc. Using the compass find out the direction that the transect line runs and mark the compass directions correctly on the map. You may use your own symbols to represent different objects on the map.

Marshland CLIMATE, WATER DATA -- MAP ON THE BACK

Location	Air Temperature (Height)									Soil Temperature (Depth)							Water Temperature					Relative Humidity				Light Intensity	
	Sur-face	1 ft.	2 ft.	3 ft.	4 ft.	5 ft.	6 ft.	7 ft.	8 ft.	1 in.	2 in.	3 in.	4 in.	5 in.	6 in.		Sur-face	1" below	3" below	6" below	Bott-om	Dry Bulb	Wet Bulb	Difference	%	Sur-face	Plant Top

A4

OUTDOOR EDUCATION CENTRE

RAVINE STUDY

DATE _____
YOUR SCHOOL _____
NAMES _____
_____
_____

TRANSECT LINE _____

PURPOSE

To study a cross section of a ravine to find out the types of plants, animals, soil and climate conditions located along a transect line.

EQUIPMENT

1. Clipboard
2. Pencil
3. 50 metre transect line
4. 2 transect poles
5. Hammer
6. 2 metre sticks
7. Trowel
8. pH paper
9. Distilled water
10. Container of water
11. Open-ended tin can
12. Wooden peg
13. Soil auger
14. Soil thermometer
15. Sling
16. Psychrometer
17. Light metre

INSTRUCTIONS

1. At the selected area, stretch out the transect line.

2. Walk up each side of the ravine until the rope is at its fullest extent and approximately level. Attach each end of the line to a pole and stake the pole in the ground.

3. At each 1 metre interval (about every 3 feet), starting at location 1 at one end, carry out the following studies along the transect line.

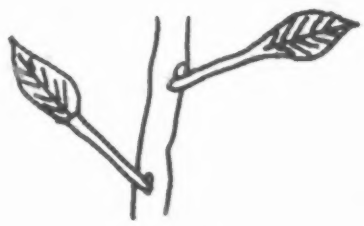
PLANT LIFE

1. Vertical Distance: ..... Measure the exact vertical (up and down) distance from each 1 metre interval on the line to the ground level directly below it.

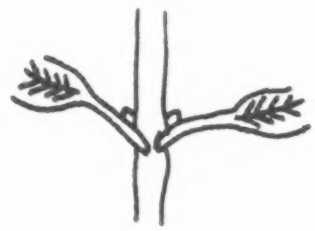
2. Plant Name: ..... Write down the name of the plant(s) found under each location.
If you don't know its name, draw an accurate picture of it.
If there were no plants nearby, write NO PLANTS.

3. Plant Height: ..... Measure the plant from the ground level to its top (in inches).

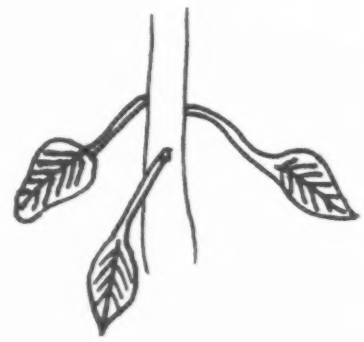
4. Leaf Arrangement: ..... Give the name of the arrangement.



ALTERNATE



OPPOSITE



5. Leaf Shape: ..... Give the name of the shape of your plant.

CIRCULAR

OVAL

ELLIPTICAL

EGG

LANCE

TRIANGULAR

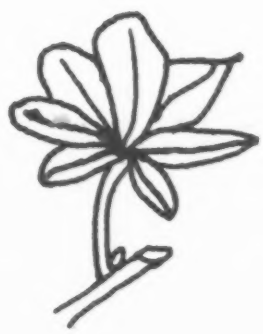
DIAMOND

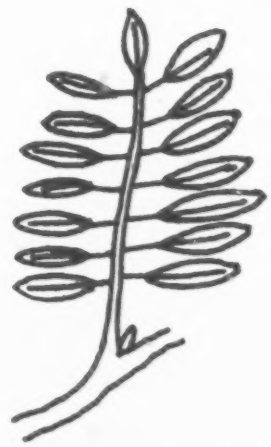
HEART

6. Leaf Type

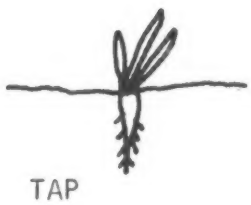
SIMPLE

COMPOUND





7. Root Type: ..... Using trowel, carefully lift up the plant by its roots.
Replace the plant in the ground when you are finished.



TAP

FIBROUS

8. Root Length: ..... Measure the root from the ground to the longest fibre tip.

9. Flowers or Seeds: ..... Draw a picture of the flowers or seeds of the plants if there are any. Describe their colour.

10. Soil Texture: ..... Moisten a small sample of soil in the palm of your hand and rub the moist soil between the thumb and finger. Observe whether the soil is gritty, smooth or sticky.

11. pH Factor: ..... Using a trowel, cut a slit into the soil. Tear off about 1 inch of pH paper and stand it upright in the soil. Pack a little soil around the paper so that some of it is exposed. Pour a little distilled water around the paper. Remove the paper and match its colour on the colour wheel. Note the pH number on the chart:

pH 1-6 = acid soil pH 8-12 = alkaline soil
pH 7 = neutral soil

12. Soil Porosity: ..... Push the end of the open tin can into the ground about 1/4 inch. Fill the can about 1/2 full of water and count the length of time it takes the water to drain away. Begin timing at the instant of pouring.

13. Soil Hardness: ..... Place the wooden peg, point down, into the ground and hit it 5 times with equal weighted blows. Measure how deep the peg went into the ground. Do this 3 times at each location and take an average depth.

14. Soil Profile: ..... At each location, push or drill the soil auger into the soil. Pull it out and observe the number of layers, the colour of each layer and the thickness of each layer.

15. Air Temperature: ..... Hold the thermometer by its dial, at a height of 3 feet (1 metre) above the ground and record the air temperature. Allow 1 minute for the thermometer to adjust to the temperature.

16. Soil Temperature: ..... Measure 1 inch on the thermometer and insert it into the ground to this depth. Leave the thermometer there until the needle stops moving, and record the temperature. Now measure 2 inches on the thermometer and repeat. Do this every inch up to 5 inches.

17. Relative Humidity: ..... Wet the piece of cotton with water and twirl the psychrometer around for at least 1 minute at about 3 feet above ground level. Note the temperature of the dry bulb thermometer, the wet bulb thermometer and the difference between these two. Using the chart calculate the amount of moisture in the air as a percentage.

18. Light Intensity: ..... Using the light metre, record the number of foot-candles of light when the metre is placed on the ground, facing north, at each location.

19. Animals Seen: ..... List any animals or signs that they are around each location.

RAVINE STUDY DATA SHEET

Location							
Vertical Distance							
Plant Name							
Picture of the Plant							
Plant Height	inches	inches	inches	inches	inches	inches	inches
Leaf Arrangement							
Leaf Shape							
Leaf Type							
Root Type							
Length of Root	inches	inches	inches	inches	inches	inches	inches
Type of Stem							
Picture of Flower or Seeds							
Soil Texture							
pH Factor							
Soil Porosity	secs.	secs.	secs.	secs.	secs.	secs.	secs.
Hardness	inches	inches	inches	inches	inches	inches	inches
Soil Profile							
No. of Layers							
Colours							
Thickness: Top	inches	inches	inches	inches	inches	inches	inches
Middle	inches	inches	inches	inches	inches	inches	inches
Bottom	inches	inches	inches	inches	inches	inches	inches
Air Temperature	°	°	°	°	°	°	°
Soil Temperature: 1"	°	°	°	°	°	°	°
2"	°	°	°	°	°	°	°
3"	°	°	°	°	°	°	°
4"	°	°	°	°	°	°	°
5"	°	°	°	°	°	°	°
6"	°	°	°	°	°	°	°
Relative Humidity	%	%	%	%	%	%	%
Light Intensity							
Animals Seen							

TABLE FOR FINDING RELATIVE HUMIDITY IN PERCENTAGES

Temperature Reading of dry-bulb thermometer	Difference in degrees Fahrenheit between wet - and dry-bulb thermometers															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
60	100%	94%	89%	84%	78%	73%	68%	63%	58%	53%	49%	44%	40%	35%	31%	27%
61	100	94	89	84	79	74	68	64	59	54	50	45	40	36	32	28
62	100	94	89	84	79	74	69	64	60	55	50	46	41	37	33	29
63	100	95	90	84	79	74	70	65	60	56	51	47	42	38	34	30
64	100	95	90	85	79	75	70	66	61	56	52	48	43	39	35	31
65	100	95	90	85	80	75	70	66	62	57	53	48	44	40	36	32
66	100	95	90	85	80	76	71	66	62	58	53	49	45	41	37	33
67	100	95	90	85	80	76	71	67	62	58	54	50	46	42	38	34
68	100	95	90	85	81	76	72	67	63	59	55	51	47	43	39	35
69	100	95	90	86	81	77	72	68	64	59	55	51	47	44	40	36
70	100	95	90	86	81	77	72	68	64	60	56	52	48	44	40	37
71	100	95	90	86	82	77	73	69	64	60	56	53	49	45	41	38
72	100	95	91	86	82	78	73	69	65	61	57	53	49	46	42	39
73	100	95	91	86	82	78	73	69	65	61	58	54	50	46	43	40
74	100	95	91	86	82	78	74	70	66	62	58	54	51	47	44	40
75	100	96	91	87	82	78	74	70	66	63	59	55	51	48	44	41
76	100	96	91	87	83	78	74	70	67	63	59	55	52	48	45	42
77	100	96	91	87	83	79	75	71	67	63	60	56	52	49	46	42
78	100	96	91	87	83	79	75	71	67	64	60	57	53	50	46	43
79	100	96	91	87	83	79	75	71	68	64	60	57	54	50	47	44
80	100	96	91	87	83	79	76	72	68	64	61	57	54	51	47	44
82	100	96	92	88	84	80	76	72	69	65	61	58	55	51	48	45
84	100	96	92	88	84	80	76	73	69	66	62	59	56	52	49	46
86	100	96	92	88	84	81	77	73	70	66	63	60	57	53	50	47
88	100	96	92	88	85	81	77	74	70	67	64	61	57	54	51	48
90	100	96	92	89	85	81	78	74	71	68	65	61	58	55	52	49
92	100	96	92	89	85	82	78	75	72	68	65	62	59	56	53	50
94	100	96	93	89	85	82	79	75	72	69	66	63	60	57	54	51
96	100	96	93	89	86	82	79	76	73	69	66	63	61	58	55	52

A5
B8

OUTDOOR EDUCATION CENTRE

Contour Mapping

Section _____

Date _____

Your School _____

Names _____

_____

_____

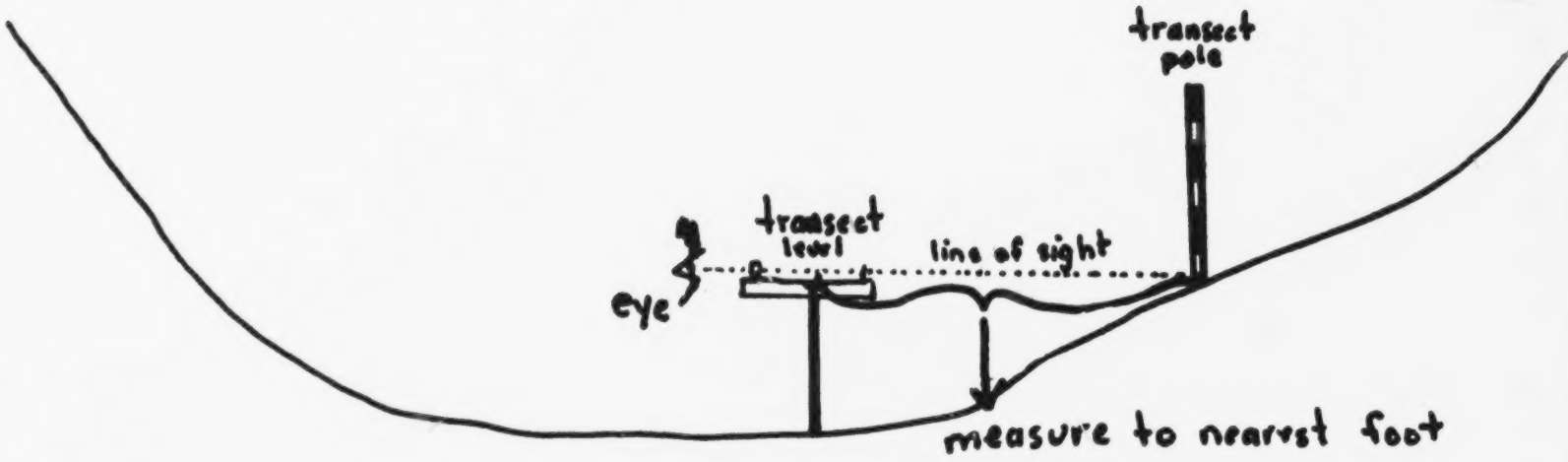
Purpose: To measure and graph a cross section of a hill and/or a ravine.

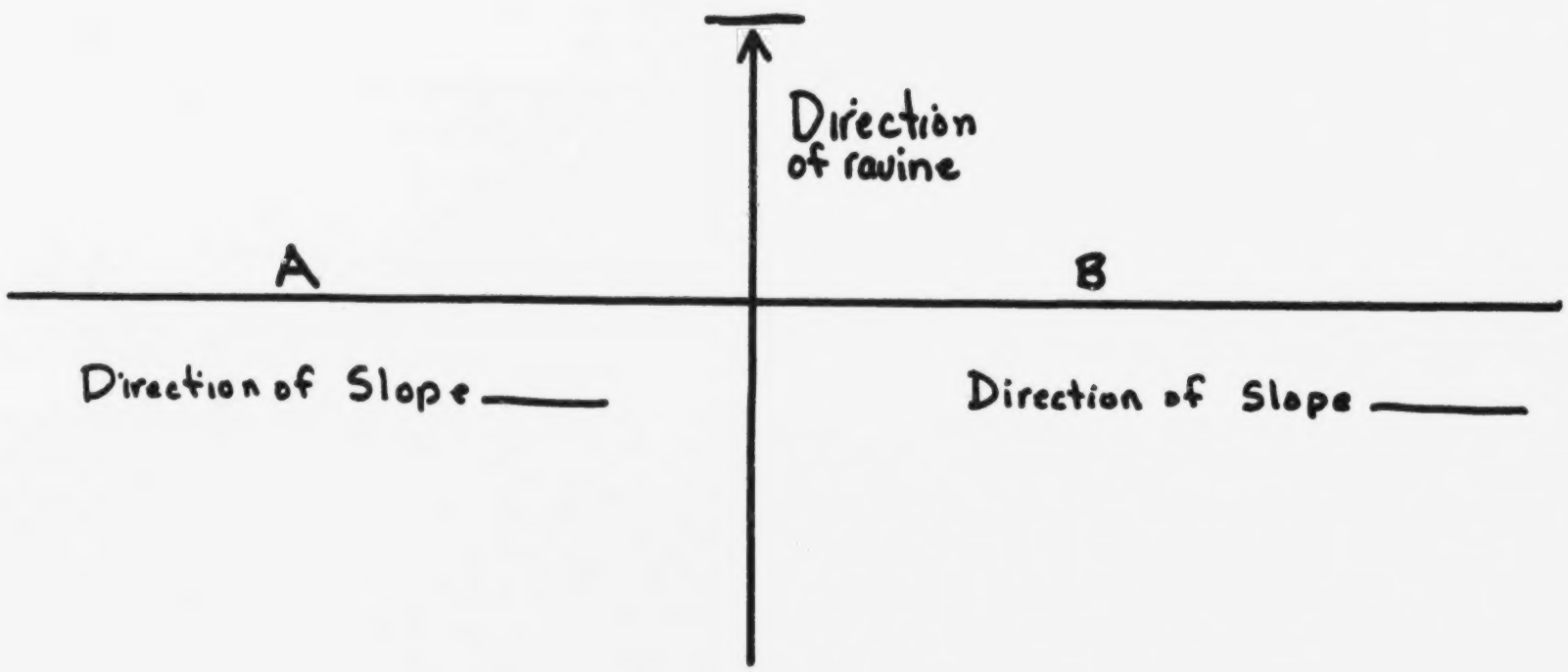
Equipment: clipboard, pencil, tape measure, compass, transect level, 2 transect poles.

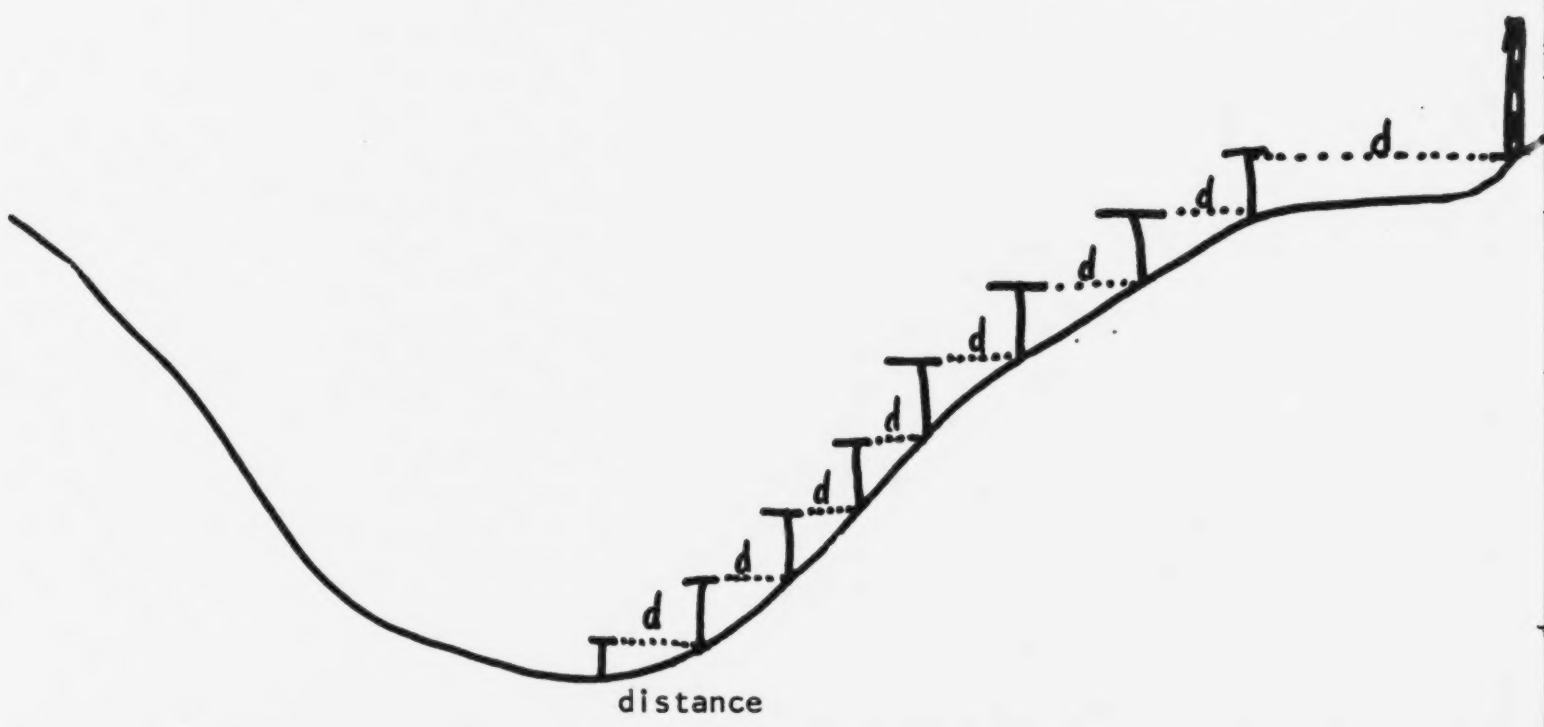
Method:

1. Go to the location given to you by the teacher.
2. In the centre of the ravine, find the direction that the ravine is running, using the compass. Note either the cardinal direction or the number of degrees in each direction.
3. Take one transect pole and climb the ravine and push the pole into the ground at the ravine top so that the pole is at right angles (90°) to the ravine direction.
4. Stand in the centre of the ravine and hold the transect level so that the bubble indicates that it is level.
5. Sight through the sights at the bank of the ravine. Have someone walk up the hill and place the second transect pole so that the bottom of the pole is in line with the line of sight. Measure the distance from the top of the transect level to the base of the transect pole to the nearest foot.
6. Take the transect level to the position of the transect pole and level the bubble. Put the transect pole in line with the line of sight and measure the distance.
7. Repeat #5, 6 until you reach the top of the ravine where the first transect pole is.
8. Repeat the same procedure for the opposite slope of the ravine.

(2)


transect pole
transect level
line of sight
eye
measure to nearest foot


Direction of ravine
A
B
Direction of Slope
Direction of Slope


d
distance

MAPPING A RAVINE

DATA SHEET

Slope A

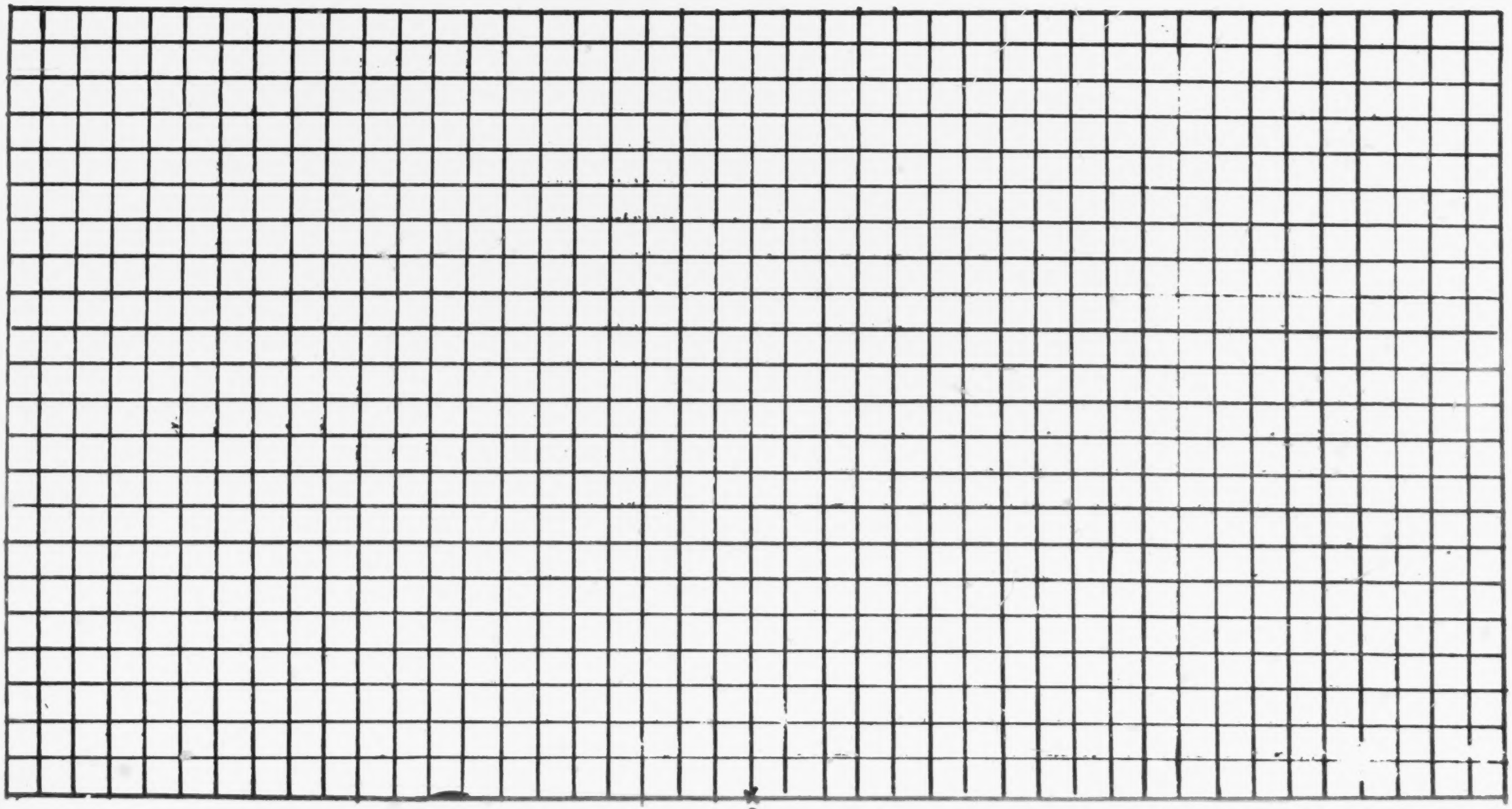
Position	Distance	
	between positions	in feet
1	1 - 2	
2	2 - 3	
3	3 - 4	
4	4 - 5	
5	5 - 6	
6	6 - 7	
7	7 - 8	
8	8 - 9	
9	9 - 10	
10	10 - 11	
11	11 - 12	
12	12 - 13	
13	13 - 14	
14	14 - 15	
15	15 - 16	
16	16 - 17	
17	17 - 18	
18	18 - 19	
19	19 - 20	
20	20 - 21	

Slope B

Position	Distance	
	between positions	in feet
1	1 - 2	
2	2 - 3	
3	3 - 4	
4	4 - 5	
5	5 - 6	
6	6 - 7	
7	7 - 8	
8	8 - 9	
9	9 - 10	
10	10 - 11	
11	11 - 12	
12	12 - 13	
13	13 - 14	
14	14 - 15	
15	15 - 16	
16	16 - 17	
17	17 - 18	
18	18 - 19	
19	19 - 20	
20	20 - 21	

1. Let 1 square = 3 ft.
2. On the line below mark on the positions of each location and the distances between each.

Slope A Slope B



A6

SPRING

OUTDOOR EDUCATION

NAME: _____

A TRIP IN THE WOODS

We are taking a "short" walk in the woods, fields and marsh areas. We will get the most out of this by keeping our eyes and ears open.

Can you answer these questions as you move from place to place? (Not necessarily in order.)

1. Make a sketch each of three animal homes.

(a)	(b)	(c)

2. Name five different trees which you saw.

(a) _____ (b) _____ (c) _____ (d) _____ (e) _____

3. Name three spring plants which you saw. (a) _____ (b) _____ (c) _____

4. Did you see any signs of insect life? _____ If you did, what were they? _____

_____

5. How many different birds have you seen this half day? _____ Name any that you knew.

_____

6. Where did you see the most new growth? (hills, valleys, north, south?) _____

7. What life did you see in or about the water? _____

_____

8. Did you see any signs of seeds being made by plants? _____ Do you know what they were?

_____

9. Describe the water that you saw. Was it clear, cloudy? _____

Do you think it would be wise to drink it? _____ Why? _____

A7
B7

OUTDOOR EDUCATION CENTRE

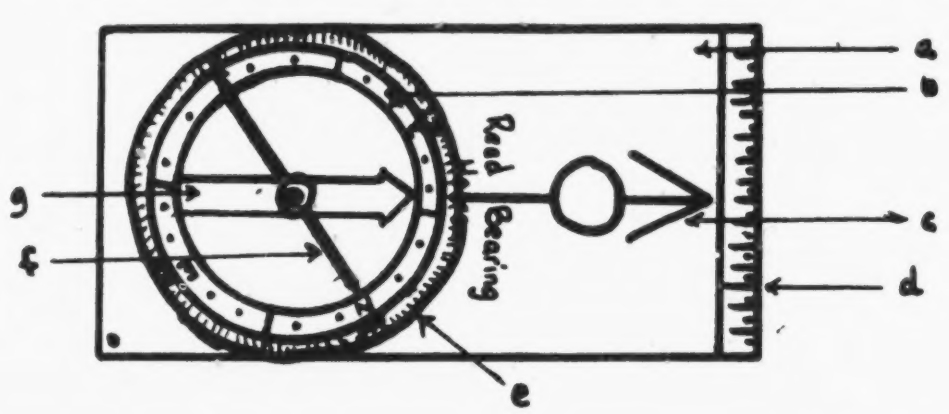
Compass Activity

Names _____

_____

_____

1. Name the parts of the compass that you are using



a. _____
b. _____
c. _____
d. _____
e. _____
f. _____
g. _____

2. What are the 8 major directions or Cardinal and Intercardinal points?

3. Into how many segments is the compass circle divided?

What is each segment called?

4. How many degrees are found at each of these directions?

N ____ E ____ SE ____ NE ____

SW____ S ____ NW ____ W ____

5. <u>How to take a Bearing on an Object</u>

Taking a bearing means to find out the number of degrees or the direction a particular object is from you. This direction is also known as the objects azimuth.

Hold the compass horizontally and:

(a) Aim the direction of the travel arrow at the object.

(b) Turn the compass dial so that the orienteering needle points to 360^{0} or N.

(c) Read the number of degrees opposite the direction of the travel arrow.

6. <u>Things to find out using your compass:</u>

(a) Does moss always grow on the north side of a tree?

(b) In what section of the sky is the sun located right now?

(c) From which direction is the wind blowing today?

(d) In which direction approximately will you have to travel to return to the Outdoor Education Centre?

COMPASS EXERCISE

SCORE: The score for a correct finish is 100.
Deduct one point for each foot of error.

Starting Point A Go 346 degrees for 102 feet Then 129 degrees for 78 feet Then 211 degrees for 58 feet Destination Reached: _____ Correct Destination: _____ Score: _____	Starting Point B Go 346 degrees for 102 feet Then 129 degrees for 78 feet Then 186 degrees for 50 feet Destination Reached: _____ Correct Destination: _____ Score: _____
Starting Point C Go 343 degrees for 104 feet Then 141 degrees for 64 feet Then 143 degrees for 61 feet Destination Reached: _____ Correct Destination: _____ Score: _____	Starting Point D Go 9 degrees for 101 feet Then 231 degrees for 78 feet Then 163 degrees for 52 feet Destination Reached: _____ Correct Destination: _____ Score: _____
Starting Point E Go 333 degrees for 112 feet Then 197 degrees for 52 feet Then 168 degrees for 51 feet Destination Reached: _____ Correct Destination: _____ Score: _____	Starting Point F Go 326 degrees for 119 feet Then 145 degrees for 61 feet Then 192 degrees for 51 feet Destination Reached: _____ Correct Destination: _____ Score: _____
Starting Point G Go 322 degrees for 125 feet Then 186 degrees for 50 feet Then 129 degrees for 78 feet Destination Reached: _____ Correct Destination: _____ Score: _____	Starting Point H Go 36 degrees for 122 feet Then 149 degrees for 58 feet Then 235 degrees for 86 feet Destination Reached: _____ Correct Destination: _____ Score: _____

COMPASS EXERCISE

SCORE: The score for a correct finish is 100.
Deduct one point for each foot of error.

Starting Point I

Go 17 degrees for 104 feet
Then 150 degrees for 52 feet
Then 142 degrees for 64 feet

Destination Reached: _____

Correct Destination: _____

Score: _____

Starting Point J

Go 326 degrees for 119 feet
Then 186 degrees for 50 feet
Then 145 degress for 61 feet

Destination Reached: _____

Correct Destination: _____

Score: _____

Starting Point K

Go 326 degrees for 119 feet
Then 145 degrees for 61 feet
Then 192 degrees for 51 feet

Destination Reached: _____

Correct Destination: _____

Score: _____

Starting Point L

Go 335 degrees for 109 feet
Then 174 degrees for 50 feet
Then 145 degrees for 61 feet

Destination Reached: _____

Correct Destination: _____

Score: _____

Starting Point M

Go 17 degrees for 104 feet
Then 237 degrees for 90 feet
Then 141 degrees for 67 feet

Destination Reached: _____

Correct Destination: _____

Score: _____

Starting Point N

Go 333 degrees for 112 feet
Then 174 degrees for 50 feet
Then 141 degrees for 64 feet

Destination Reached: _____

Correct Destination: _____

Score: _____

Starting Point O

Go 12 degrees for 101 feet
Then 237 degrees for 90 feet
Then 138 degrees for 67 feet

Destination Reached: _____

Correct Destination: _____

Score: _____

Starting Point P

Go 348 degrees for 102 feet
Then 135 degrees for 71 feet
Then 207 degrees for 56 feet

Destination Reached: _____

Correct Destination: _____

Score: _____

COMPASS EXERCISE

SCORE: The score for a correct finish is 100.
Deduct one point for each foot of error.

Starting Point Q Go 17 degrees for 104 feet Then 237 degrees for 90 feet Then 141 degrees for 67 feet Destination Reached: _____ Correct Destination: _____ Score: _____	Starting Point R Go 17 degrees for 104 feet Then 150 degrees for 52 feet Then 142 degrees for 64 feet Destination Reached: _____ Correct Destination: _____ Score: _____
Starting Point S Go 38 degrees for 125 feet Then 237 degrees for 90 feet Then 186 degrees for 50 feet Destination Reached: _____ Correct Destination: _____ Score: _____	Starting Point T Go 22 degrees for 107 feet Then 158 degrees for 54 feet Then 186 degrees for 50 feet Destination Reached: _____ Correct Destination: _____ Score: _____
Starting Point U Go 3 degrees for 100 feet Then 132 degrees for 74 feet Then 225 degrees for 69 feet Destination Reached: _____ Correct Destination: _____ Score: _____	Starting Point V Go 34 degrees for 119 feet Then 186 degrees for 50 feet Then 228 degrees for 74 feet Destination Reached: _____ Correct Destination: _____ Score: _____
Starting Point W Go 326 degrees for 119 feet Then 186 degrees for 50 feet Then 145 degrees for 61 feet Destination Reached: _____ Correct Destination: _____ Score: _____	Starting Point X Go 322 degrees for 125 feet Then 186 degrees for 50 feet Then 129 degrees for 78 feet Destination Reached: _____ Correct Destination: _____ Score: _____

Starting Point Y Go 333 degrees for 112 feet Then 197 degrees for 52 feet Then 168 degrees for 51 feet Destination Reached: _____ Correct Destination: _____ Score: _____	

A8

OUTDOOR EDUCATION CENTRE

ART APPRECIATION

Some of the ideas which might be used include charcoal sketching of tree shapes or general overall scenes, stressing proper form, depth, etc.

If the class brings its own wax or pencil crayons, these could be used instead.

Other activities could involve collecting materials from the area which could be used in a collage, a printing effect (spatter, blueprinting -- if you bring the necessary materials).

Pupils could also discover the various designs, shapes, and arrangements used in nature and incorporate these into their own ideas.

If the classroom teacher wishes to try any of her/his own ideas in an outdoor lesson, this is quite permissible as long as he provides any materials which the Centre does not have.

CREATIVE ENGLISH

This is an opportunity for the pupil to go off by himself and work on a piece of creative poetry, prose, or story about what he sees, hears, feels about the area he is in.

The classroom teacher could use this for any other form of creative work as he or she wishes.

A9

OUTDOOR EDUCATION CENTRE

DATE: _____
YOUR SCHOOL: _____
NAMES: _____
_____
_____

LAND USE CAPABILITY

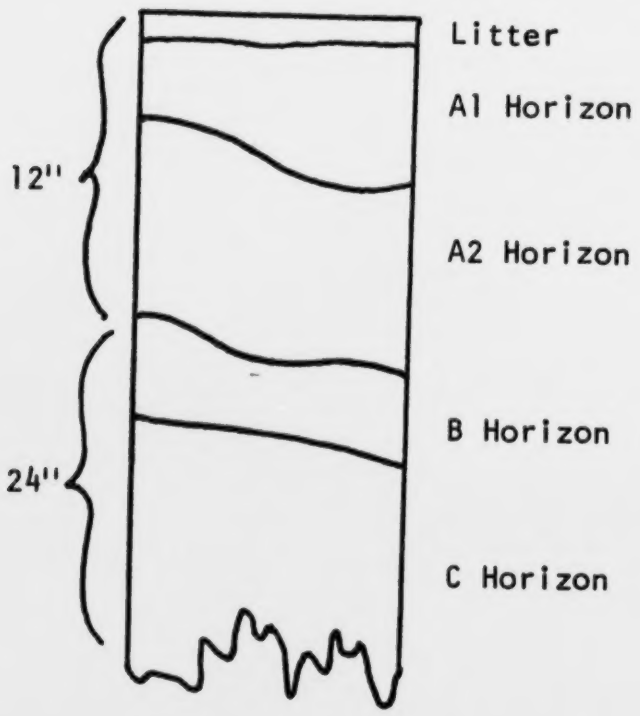
EQUIPMENT

1. Clipboard
2. Pencil
3. Soil auger
4. Clinometer
5. pH paper roll
6. Container of distilled water
7. Trowel

SOIL PROFILES

The soil profile is an important part of rating soils. Soils occur in a series of zones known as horizons. These different horizons occur as a result of leaching and the precipitation of minerals caused by the downward trickling (percolation) of soil water. A soil profile can be used as a gauge of soil erosion.

You can see a soil profile by drilling into the soil to a depth of at least one foot and observing various features of the texture, drainage and colour of the soil. This should be done in as many different areas as possible.



Soil is our basic natural resource. All life depends upon soil, either directly or indirectly. Soil is valuable in many other ways too.

TO DO

Examine the soil obtained from the soil auger and classify it and the surrounding area on the chart on Page 71.

1. Colour

Minerals, moisture, oxidation, weathering, resistance of some elements to weathering, humus and decaying plant and animal material all affect soil colour.

What is the colour of the:

(a) litter?
(b) A Horizon?

2. pH Factor

Tear off about one inch of pH paper from the roll and press it into a section of the soil sample. Add a few drops of distilled water to the soil around the paper. After a minute remove the paper and compare the colour with the colour guide: 1 - 6 = acid soil; 7 = neutral soil; 8 - 14 = alkaline soil.

3. Seven physical characteristics are used in placing a soil into the proper capability class. They are:

(a) texture
(b) drainage
(c) flooding
(d) topography
(e) stoniness
(f) erosion
(g) depth to bedrock

(a) Texture:

Pick up some soil and rub it between your fingers. Decide which of the following types the soil would be and check only one answer on the chart.

Sand: ..... Mostly large soil particles; feels coarse and gritty

Sandy Loam: .... Mostly sand with some silt and clay; feels gritty; not as loose as sand

Loam: ..... Equal amounts of sand, silt and clay; slightly gritty
Silt Loam but fairly smooth; slightly plastic when wet

Clay Loam: ..... Contains enough clay to be sticky; lumpy when dry

Clay: ..... Mostly clay (smallest soil particles); smooth feel; sticky and plastic when wet; hard and cloddy when dry

(b) Topography:

Refers to the lay of the land.
Using the clinometer and standing either at the top or the bottom of a hill, sight either down or up the hill in a line parallel to the slope and read the angle of slope.

Decide which of the following features best describes the topography of the area. Check only one answer on the chart.

Level: ..... (0 - 2% slopes); slope is two feet or less per 100 feet of horizontal distance; land flat or nearly so

Gently Sloping: (3 - 6% slopes); more erosion possible; no abrupt change in steepness or direction

Rolling: ..... (7 - 12% slopes); moderate erosion possible; still no serious handicap to farm machinery

Hilly: ..... (13 - 20% slopes); difficult to use farm machinery; moderately severe erosion possible

Steep: ..... (21 - 30% slopes); not suited to extensive use of farm machinery; susceptible to severe erosion

Very Steep: .... (over 30% slopes); severe erosion; not suited to farm use

(c) Stoniness (Topsoil):

Pick up several handfuls of soil and sift it through your hand. Decide which feature best describes the soil. Check only one answer.

Stone Free
Slightly Stony
Moderately Stony
Very Stony
Excessively Stony

(d) Erosion:

Observe the land about you and decide which of the following features best describe the area. Check only one feature.

None: ..... No noticeable erosion

Slight: ..... Up to one-half of topsoil removed

Moderate: ..... Most surface soil removed

Severe: ..... All surface soil removed

Very Severe: ... Gullies too deep and too numerous fo· reguiar cultivation

(e) Drainage:

Check only one feature about the condition of the soil as seen in the soil profile.

Good: ..... Movement of air and water through soil not restricted; layers within soil well defined

Fair: ..... Fairly good movement of water and air; surface layers darker than in well drained soils; layers less well defined

Poor: ..... Water and air movement through soil is restricted; surface soil very dark; reddish brown streaks common in underlying layers

Very Poor: ..... Usually a swamp or bog; surface is black; reddish brown streaks common

(f) Flooding:

Check one of the following conditions:

No Flooding
Flooding

(g) Depth to Bedrock:

Without digging into the soil try and estimate the depth to the bedrock. Check only one answer.

Over 3 Feet
2 - 3 Feet
1 - 2 Feet
Under 1 Foot

LAND USE CAPABILITY DATA SHEET

	CHARACTERISTIC	DEDUCTION	EXAMPLE	LOCATION		
1.	Colour of Soil		Light Brown			
2.	pH Factor		6			
3a	Texture--Sand	20				
	Sandy Loam	5	5			
	Loam,Silt Loam	0				
	Clay Loam	5				
	Clay	10				
3b	Topography--Level	0				
	Gently Sloping	5				
	Rolling	10	10			
	Hilly	20				
	Steep	40				
	Very Steep	45				
3c	Stoniness--Stone Free	0				
	Slightly Stony	5				
	Moderately Stony	10	10			
	Very Stony	25				
	Excessively Stony	40				
3d	Erosion--None	0				
	Slight	5	5			
	Moderate	10				
	Severe	20				
	Very Severe	30				
3e	Drainage--Good	0	0			
	Fair	10				
	Poor	25				
	Very Poor	40				
3f	Flooding--No Flooding	0	0			
	Flooding	30				
3g	Depth to Bedrock--Over 3 ft.	0	0			
	2 - 3 ft.	20				
	1 - 2 ft.	40				
	Under 1 ft.	65				
	TOTAL DEDUCTIONS		100 - 20			
	SCORE		80			
	SOIL CLASS (See next page)		11			

LAND CLASS

The seven land characteristics for each area have numbers to the right of each description. As a guide to the proper land class, add up the numbers which are opposite the descriptions you selected and subtract this figure from 100. Select the land class below that is represented by the value you have obtained for each area.

CLASS	SCORE	LAND SUITABLE FOR CULTIVATION
I	100 - 95	Has good drainage, loam texture, and is level. A high level of production can be maintained on this land.
II	90 - 80	Subject to moderate limitations in use but can be cultivated safely with special practices. Its limitations may be fair drainage, rolling topography, moderate erosion, moderate stoniness or a combination of two or more factors, eg. rolling topography and slightly stony.
III	75 - 65	Usually has the same handicaps characteristic of Class II land, but to a greater extent. Class III land requires more protection than either of the above two classes.
IV	60 - 55	Subject to severe limitations for use in crop production. Too susceptible to erosion, too stony or too poorly drained to be cultivated frequently. The sloping land can be maintained best in hay and pasture.
		LAND NOT SUITABLE FOR CULTIVATION
V	50 - 40	Suited for grazing, forestry and wildlife. It is wet land (may be moderately stony) that cannot be economically drained or land that cannot be economically protected from flooding, such as river flats.
VI	35 - 25	This land should be kept in permanent vegetation because of steepness of slope, severe erosion, shallow soil or other features that make cultivation impractical. Suitable for moderable grazing and forestry.
VII	20 - 10	Subject to severe limitations. The use of this land should be restricted to forestry or limited grazing.
		NON-AGRICULTURAL LAND
VIII	Less than 10	Rock outcrop, quarries, peat bogs and other areas not suited to commercial forestry but may be suitable for wildlife, recreation, etc.

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VIII	Less than 10	Rock outcrop, quarries, peat bogs and other areas not suited to commercial forestry but may be suitable for wildlife, recreation, etc.

A10

OUTDOOR EDUCATION CENTRE

Date: _____
Your School: _____
Names: _____
_____
_____

STREAM STUDIES

Section __

PURPOSE

To study and map the characteristics of a stream and the surrounding animal and plant life.

EQUIPMENT

1. Clipboard
2. Pencil
3. Transect line
4. Transect poles
5. Compass
6. Meter stick
7. Thermometer
8. Plastic vials
9.
10. Seine net
11. Dip net
12. Hammer

METHOD

Go with your teacher to the stream and select a 25 foot area of the stream which is not too deep or hard to get at. Stretch out the transect line across the stream and stake it into the ground at both ends. Pull the line tight and check to see if it is level or parallel to the water line.

1. Cross-Section View

   (a) Starting at one end of the line and at 3 foot (1 metre) intervals measure and record the vertical distance to the ground or stream bottom.

   (b) Measure and record the distance from the line to the water level.

   (c) Measure and record the distance between the transect poles.

   (d) Measure and record the width of the stream (water edge to water edge) at the transect line.

   (e) Examine and record the type of stream bottom at each interval.

2. Measuring Temperatures

(a) Tape a thermometer to one end of the meter stick.

(b) Record the air temperature at the transect line.

(c) Record the air temperature just above the water line.

(d) Starting at one side (A) of the stream measure the water temperature at every two foot interval just below the water line and on the stream bottom.

(e) Measure the temperature of the land on each side of the stream.

3. Stream Speed

(a) At the transect line, drop a empty pill vial exactly in the centre of the stream and observe how far it travels in ten seconds. Measure the distance it travelled.

(b) Repeat dropping the vial at either side of the stream and measure the distance it travelled.

(c) Multiply the number of feet travelled by six and that answer by 60 to get the speed in feet per hour.

4. Plant Life

(a) At the transect line measure the height of the plants found on shore A and on shore B.

(b) Name the kind of plants found there.

5. Animal Life

(a) Using either the dip net or drag net go up the stream starting at a distance 25 feet downstream from the transect line and collect any samples of animal life.

(b) Draw a picture of the animal, measure the length, and the depth of water where you found the animal.

(c) Walk along the stream banks in your section noting any sign of animal life.

(d) Draw a diagram of any tracks you see or any other signs such as gnawings, burrows, droppings.

6. Mapping the Area

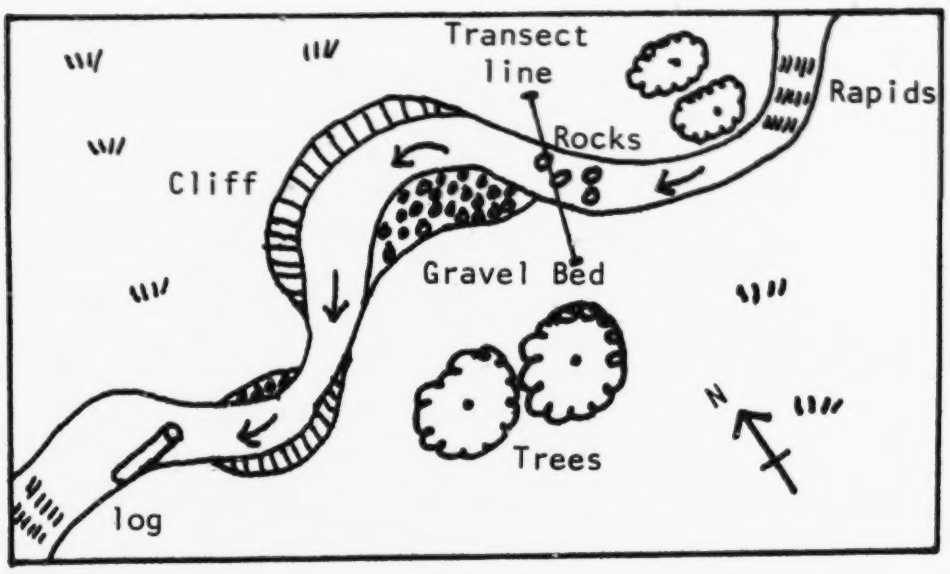
(a) Draw a map and show the exact location of the stream in your section.

(b) Your map should show the location of all trees, logs, gravel beds, rocks, rapids, areas of cliffs, debris.

(c) Using your compass find out the direction that the stream is moving and show this on the map.

(d) Show the location of the transect line.

Example:



STREAM STUDY DATA SHEET

Location A Interval	Vertical Distance to Ground and Stream Bed	Type of Stream Bottom	Air Temp. at Line	Air Temp. at Water Level	Water Temp. Below Surface	Water Temp. at Stream Bottom	Height of Plants	Plant Name
0 ft.,0 m.	in.		°	°	°	°	in.	
3 ft.,1 m.	in.		°	°	°	°	in.	
6 ft.,2 m.	in.		°	°	°	°	in.	
9 ft.,3 m.	in.		°	°	°	°	in.	
12 ft.,4 m.	in.		°	°	°	°	in.	
15 ft.,5 m.	in.		°	°	°	°	in.	
18 ft.,6 m.	in.		°	°	°	°	in.	
21 ft.,7 m.	in.		°	°	°	°	in.	
24 ft.,8 m.	in.		°	°	°	°	in.	
27 ft.,9 m.	in.		°	°	°	°	in.	
30 ft.,10 m	in.		°	°	°	°	in.	
33 ft.,11 m	in.		°	°	°	°	in.	
36 ft.,12 m	in.		°	°	°	°	in.	
39 ft.,13 m	in.		°	°	°	°	in.	
42 ft.,14 m	in.		°	°	°	°	in.	
45 ft.,15 m	in.		°	°	°	°	in.	
48 ft.,16 m	in.		°	°	°	°	in.	
51 ft.,17 m	in.		°	°	°	°	in.	
54 ft.,18 m	in.		°	°	°	°	in.	
57 ft.,19 m	in.		°	°	°	°	in.	
60 ft.,20 m	in.		°	°	°	°	in.	
Location B								

Width of transect line = _____ft.

Width of Stream = _____ft.

Temperature of the land = _____°

Distance of transect line above the water line = _____in.

Stream Speed: At one side, distance travelled in 10 secs.=___ft.;in 1 min.=___ft.;in 1 hr.=___ft.
At other side, distance travelled in 10 secs.=___ft.;in 1 min.=___ft.;in 1 hr.=___ft.
In the middle, distance travelled in 10 secs.=___ft.;in 1 min.=___ft.;in 1 hr.=___ft.

Animal Life in Water

Diagram	Size	Depth of Water Where Found

Animal Life on Land

Diagram of Track	Location Where Found	Other Signs Seen

STREAM STUDY

Map of the Area: Show all the details exactly where they are in your area. (See Page 2)

B1

WOODLOT STUDIES

OUTDOOR EDUCATION INSTRUCTION SHEET

Section _____

DATE _____

YOUR SCHOOL _____

NAMES _____

_____

_____

Purpose: To measure the trees in a selected woodlot area and to calculate the value of the wood.

Equipment: tree calipers, plastic tape measure, clinometer, Biltmore Stick, marker tapes

Procedure:

1. Go to the area selected by the instructor and locate 1/5 of an acre, 66' wide by 132' long, and find a coloured marker at each corner.

2. Starting at one side of the area walk through the measured area finding the following information about all the trees in the area 8 inches or over in diameter.

   (a) Tree Diameter -- Measure the average diameter of the tree taken at chest height using the tree calipers.

   (b) Tree Circumference -- Measure the circumference (distance around) of the tree at chest height using the plastic tape measure.

   (c) Tree Height -- Walk away from the tree to be measured and using the clinometer sight the top of the tree with an angle of 45°.

   (d) Number of 8 foot logs -- Stand 60 ft. away from the tree and using the Biltmore Stick calculate the number of 8 foot logs in the tree from the base of the tree to first main branching of the tree.

   (e) Tree Identification -- Name the type of tree.

WOODLOT STUDIES

Tree No.	Diameter	Circum-ference	Tree Height				Number of 8 ft. logs	Name of Tree
			Angle of Sighting	Height To Eye Level	Distance to Tree	Height of Tree		
Example	12"	40"	45°	5'2"	48' ADD	53'2"	6	White Oak
1			45°					
2			45°					
3			45°					
4			45°					
5			45°					
6			45°					
7			45°					
8			45°					
9			45°					
10			45°					
11			45°					
12			45°					
13			45°					
14			45°					
15			45°					
16			45°					
17			45°					
18			45°					
19			45°					
20			45°					

Calculation of the Volume of Timber on an Area

A	B	C	D	E	F
Tree Diameters	Number of Trees at Each Diameter	Number of 8 foot logs	Total logs	Board feet in one log	Total Board Feet D x E
8"				8	
9"				12	
10"				18	
11"				24	
12"				32	
13"				41	
14"				50	
15"				61	
16"				72	
17"				85	
18"				98	
19"				113	
20"				128	
21"				144	
22"				162	
23"				180	
24"				200	
25"				220	
26"				242	
27"				265	
28"				288	
29"				312	
30"				338	
31"				365	
32"				392	
33"				421	
34"				450	

Total Boardfeet _____

B2

OUTDOOR EDUCATION CENTRE

Moss Study

Section _____

Date _____

Your School _____

Names _____

_____

_____

Purpose: It is said that moss grows best on the north side of trees. Is this idea correct, and could it be useful in an emergency? The following activity will help you to answer that question.

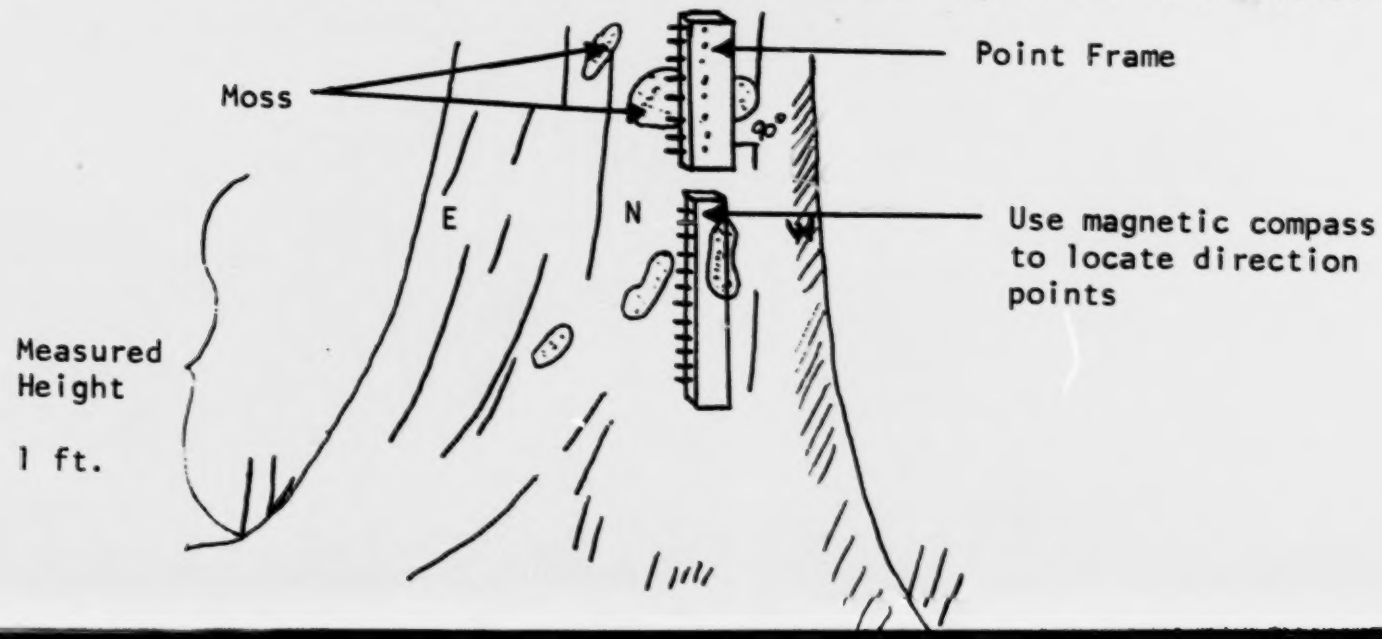
Equipment: clipboard, pencil, compass, moss point frame, chalk.

Method:

1. In each of the five different kinds of locations indicated to you by your instructor, pick out 10 trees having some evidence of moss, algae or lichens.
2. Using a compass and a piece of chalk, mark the four directions N S E W on the trunk of each.
3. Take the moss point frame and place the lowest nail of the point frame at the base of the tree on the North side and position the point frame so that it is at right angles to the ground. Count the number of nails that are touching moss. Re-position the point frame directly above the first position on the trunk of the tree. Count the number of nails that are touching moss.
4. Repeat this procedure for the South, East, and West sides of the tree recording the information on the following charts.
5. After you have completed examining the moss on each of the 10 selected trees in one area, move with your instructor to the next area.

NOTE:

1. Rub off the directions marked on the tree with the chalk.
2. The point frame must be placed in the same manner each time, and only the moss that is touching, or directly under the point of a nail must be considered. Shifting the frame one way or the other to include or avoid a patch of moss must be regarded as "cheating" and will reduce the accuracy of the conclusions.



OUTDOOR EDUCATION MOSS STUDY DATA SHEET

LOCATION	WOODED HILLTOP			
Tree	North	South	East	West
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
TOTAL				

LOCATION	NORTH SLOPE			
Tree	North	South	East	West
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
TOTAL				

LOCATION	SOUTH SLOPE			
Tree	North	South	East	West
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
TOTAL				

LOCATION	EAST SLOPE			
Tree	North	South	East	West
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
TOTAL				

LOCATION	WEST SLOPE			
Tree	North	South	East	West
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
TOTAL				

LOCATION	RIVER BANK/SWAMPY AREA			
Tree	North	South	East	West
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
TOTAL				

OUTDOOR EDUCATION MOSS STUDY

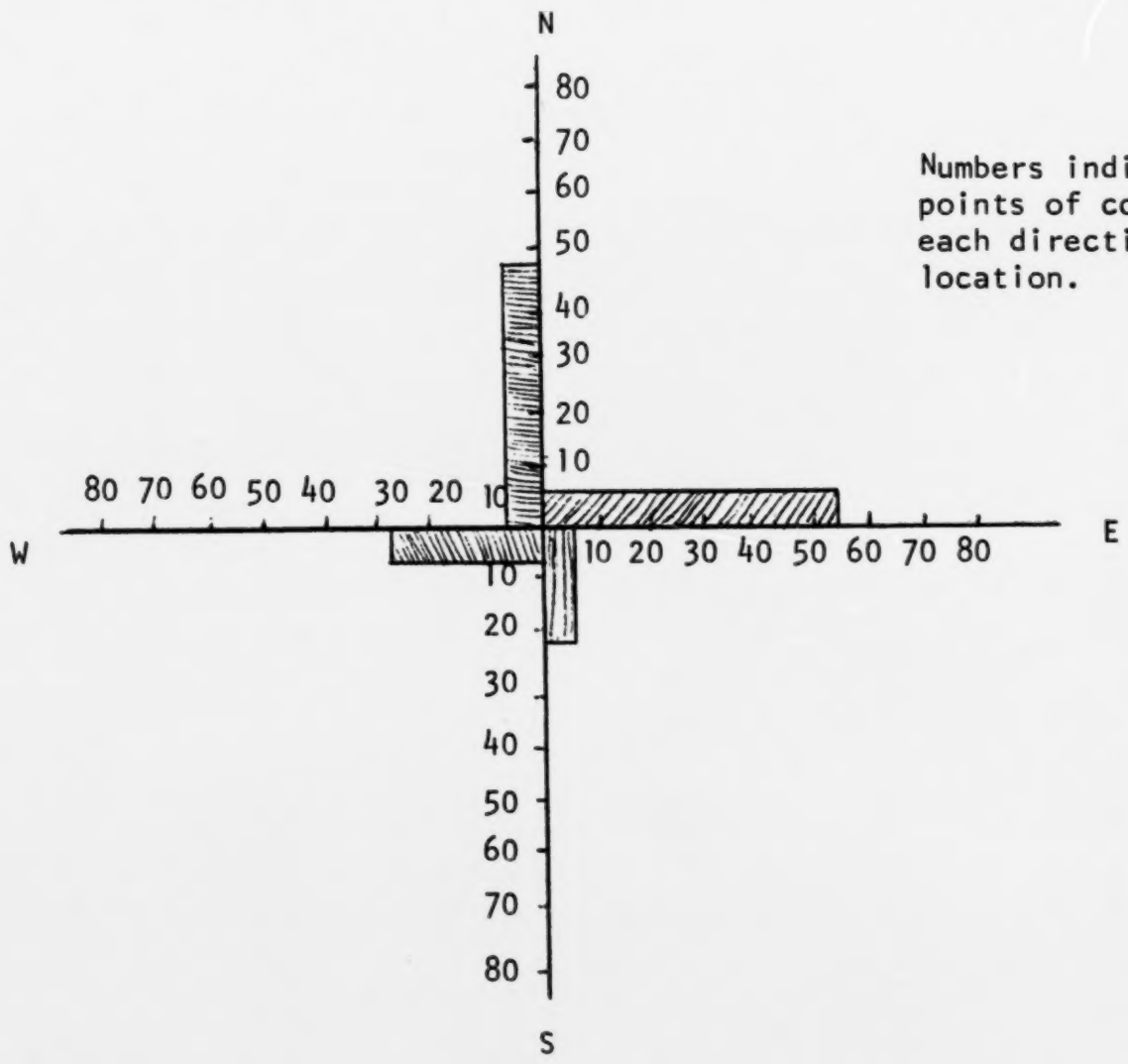
To Answer the Problem About Moss Growth

By totalling the numbers for each direction in the various locations, we can find whether the moss occurs consistently on any particular side of the trees and whether different locations affect the growth of moss. For each location chosen, the totals can be shown on a "ray graph" as illustrated below.

From all this you should be able to decide whether this method for finding North would be sufficiently reliable to be used in an emergency situation.

Using the results from your survey make graphs similar to the one below for each location studied.

Example -- Ray Graph to Show Moss Distribution at Each Location



Numbers indicate total points of contact for each direction at each location.

B3

WINTER STUDIES

OUTDOOR EDUCATION INSTRUCTION SHEET

Woodland-Grassland

DATE _____

YOUR SCHOOL _____

NAMES _____

_____

_____

Purpose: To examine two different areas, woodland and grassland, to note the various climatic, snow and soil conditions found in each.

Equipment: Clipboard, pencils, dial type thermometer, 100 ft. of transect line, meter stick, soil auger, light meter, wind speed indicator, wind vane, wooden stand, compass, hammer, nail, 18 inch ruler

Instructions: 1. Stretch out the 100 feet of transect line from the woodland into the grassland so that 50 feet of it is in each area.

At every 5 foot location starting at either end, carry out the following investigations:

(a) Air Temperature -- measure the air temperature at ground level, allowing at least one minute for the needle of the thermometer to change. Measure the temperature at every foot height up to 5 feet.

(b) Soil Temperature -- using the hammer and spike make a hole into the ground 6 inches deep and place the thermometer into the hole to get the temperature.

(c) Depth of Snow -- using the 18 inch ruler measure how deep the snow is at each level.

(d) Temperature of the Snow -- using the thermometer, measure the temperature (1) at the surface of the snow, (2) in the middle of the snow layer, (3) at the bottom of the snow layer.

(e) Wind Direction -- Set up the weather vane on the nail at the top of the wooden stand. Stand back from the stand and allow the wind to move the feather. Using the compass find the direction from which the wind was blowing.

(f) Wind Speed -- Hold up the wind speed indicator so that you are facing into the wind and so that you can see the white ball in the indicator. Note how far the wind pushes the white ball up the tube and measure this in miles per hour.

(g) Wind Chill -- At each location, note what the temperature was at 5 feet high and how fast the wind was blowing. To determine the chilling effect of the wind, find the temperature along the top line of the following chart, then read down the column to the line corresponding to the wind speed.

Wind Chill Chart

Wind Speed in Miles Per Hour	Temperature in °F.										
0	30	25	20	15	10	5	0	-5	-10	-15	-20
10	20	14	8	2	-4	-10	-15	-21	-27	-33	-39
15	13	7	0	-6	-12	-18	-25	-31	-38	-44	-50
20	9	2	-5	-12	-19	-25	-32	-39	-45	-52	-59
25	5	-2	-9	-17	-24	-30	-37	-44	-51	-58	-65
30	3	-5	-12	-20	-27	-33	-41	-48	-55	-63	-70
35	0	-7	-14	-22	-29	-36	-44	-51	-58	-66	-73
40	-1	-9	-16	-24	-31	-38	-46	-53	-61	-69	-76

(h) Light Intensity -- Using the light meter, take off the protective flap and hold it towards the North. Read the number of light footcandles at ground level and at a 3 foot height.

(i) Soil Profile Frost Level -- Using the soil auger drill into the ground and remove a core sample of soil. Measure the depth to which the frost has gone.

(j) Animal Life -- Note any animals seen or any evidences of animal life (tracks, scats, animal droppings, trails, gnawings) found in either the woodland or the grassland.

DATA SHEET -- WINTER STUDIES -- GRASSLAND TO WOODLAND

Location	Air Temperature Height: Surface	1 ft	2 ft	3 ft	4 ft	5 ft	Soil Temp. 6 inch depth	Depth of Snow in Inches	Snow Temperature: Snow Surface	Middle Area	Bottom of Snow	Wind Direction	Wind Speed in m.p.h.	Air Temp. 5 ft. High	Wind Chill Factor (use chart)	Light Intensity footcandles: Surface	3 ft, High	Soil Profile Frost Level in inches	Animals Seen or Signs of Animal Life Draw diagram	Location Where Seen
Ex.	30°	30°	29°	29°	28°	28°	26°	4 inches	30°	32°	30°	N.W.	6	28°	20°	60	40	8 inches	crow tracks	woods grassland
1.																				
2																				
3																				
4																				
5																				

DATA SHEET -- WINTER STUDIES -- GRASSLAND TO WOODLAND

Location	Air Temperature Height						Soil Temp.	Depth of Snow	Snow Temperature			Wind Direction	Wind Speed in m.p.h.	Air Temp. 5 ft. High	Wind Chill Factor (use chart)	Light Intensity footcandles		Soil Profile Frost Level in inches	Animals Seen or Signs of Animal Life Draw diagram	Location Where Seen
	Surface	1 ft	2 ft	3 ft	4 ft	5 ft	6 inch depth	in Inches	Snow Surface	Middle Area	Bottom of Snow					Surface	3 ft, High			
Ex.	30°	30°	29°	29°	28°	28°	26°	4 inches	30°	32°	30°	N.W.	6	28°	20°	60	40	8 inches	crow tracks	woods grassland
6																				
7																				
8																				
9																				
10																				

DATA SHEET -- WINTER STUDIES -- GRASSLAND TO WOODLAND

Location	Air Temperature Height						Soil Temp.	Depth of Snow	Snow Temperature			Wind Direction	Wind Speed in m.p.h.	Air Temp. 5 ft. High	Wind Chill Factor (use chart)	Light Intensity footcandles		Soil Profile Frost Level in inches	Animals Seen or Signs of Animal Life Draw diagram	Location Where Seen
	Surface	1 ft	2 ft	3 ft	4 ft	5 ft	6 inch depth	in Inches	Snow Surface	Middle Area	Bottom of Snow					Surface	3 ft, High			
Ex.	30°	30°	29°	29°	28°	28°	26°	4 inches	30°	32°	30°	N.W.	6	28°	20°	60	40	8 inches	crow tracks	woods grassland
11																				
12																				
13																				
14																				
15																				

DATA SHEET -- WINTER STUDIES -- GRASSLAND TO WOODLAND

Location	Air Temperature Height						Soil Temp.	Depth of Snow	Snow Temperature			Wind Direction	Wind Speed in m.p.h.	Air Temp. 5 ft. High	Wind Chill Factor (use chart)	Light Intensity footcandles		Soil Profile Frost Level in inches	Animals Seen or Signs of Animal Life Draw diagram	Location Where Seen
	Surface	1 ft	2 ft	3 ft	4 ft	5 ft	6 inch depth	in Inches	Snow Surface	Middle Area	Bottom of Snow					Surface	3 ft, High			
Ex.	30°	30°	29°	29°	28°	28°	26°	4 inches	30°	32°	30°	N.W.	6	28°	20°	60	40	8 inches	crow tracks	woods grassland
16																				
17																				
18																				
19																				
20																				

B4

OUTDOOR EDUCATION INSTRUCTION SHEET

Winter Studies
Marshland

Date _____

Your School _____

Names _____

_____

_____

Purpose: To investigate the conditions of water and life in a marsh area.

Equipment: Clipboard, pencils, ice auger, maximum - minimum thermometer, dial type thermometer, 50 ft. of rope, 18 inch ruler, plastic vials, wooden stand, wind vane, wind speed indicator, nylon fishingline, corked bottles.

Method:

1. At a location on the marsh ice, bore a hole through the ice using the ice auger. Warning: Be sure to replace the safety shield over the blade when you are finished as it is very sharp.

2. At each location carry out the following studies:

(a) Depth of snow - Using the ruler measure how thick the snow is near the hole.

(b) Depth of ice - Measure how thick the ice is around the hole.

(c) Depth of water - Lower the rope with the weighted end into the hole until it hits the bottom of the marsh (the rope will become slack). Note the water mark on the rope and pull the rope in measuring how far it went.

(d) Water temperature - Attach the maximum-minimum thermometer to the rope and using the magnet set the metal slide in the thermometer right against the mercury. Lower the thermometer to the required depth leaving it there for at least one minute. Remove the thermometer, read the temperature and reset the metal slide.

(e) Air temperature - Using the dial type thermometer, measure the air temperatures at various heights from the surface to a height of 5 feet. Allow at least one minute for the needle to change.

(f) Wind direction - Set the feather wind vane on the nail support of the wooden stand. Stand back and observe the direction from which the wind is blowing using the compass.

(g) Wind speed - Hold the wind speed indicator so that you can see the white ball and you are facing into the wind. Note how far the wind pushes the white ball up the tube.

(h) Water and mud sample - Attach the fishing line around the empty weighted bottle and put the cork in place. Drop the corked bottle through the hole to the required depth (1 foot; marsh bottom) and then pull the cork out by pulling up on one line. After a minute pull up the bottle and pour the contents into a plastic vial. Take the vial back to the outdoor centre for examination under the microscope.

DATA SHEET

WINTER STUDIES MARSHLAND

Location		Example	1	2	3
Depth of Snow (a)		1"			
Depth of Ice (b)		8"			
Depth of Water Under Ice (c)		12 ft.			
Water Temperature (d) Depth	1 foot	32°			
	2 feet	31°			
	3 feet	31°			
	4 feet	33°			
	5 feet	33°			
	6 feet	34°			
	7 feet	34°			
	8 feet	36°			
	9 feet	37°			
	10 feet	37°			
	Bottom	36°			
Air Temperature (e)	Surface	31°			
	1 foot	30°			
	2 feet	29°			
	3 feet	29°			
	4 feet	28°			
	5 feet	26°			
Wind Direction (f)		S. W.			
Wind Speed (g)		4 m.p.h.			
Animals Seen or Signs of Animals (h)		tracks in ice			

OUTDOOR EDUCATION CENTRE

Date: _____
Your School: _____
Names: _____

ANIMALS IN WINTER

Section __

PURPOSE

To learn how to recognize and identify tracks and other signs of animals which are around during the winter.

EQUIPMENT

1. Clipboard
2. Pencil
3. Measuring tape

METHOD

1. Go with your teacher to where there is a section of untrampled snow.

2. (a) Have one member of your group walk normally through the snow.

   (b) Measure the length of his step (from the toe of one print to the heel of the next).

   (c) Find out which part of the foot digs deeper into the snow -- heel or toe.

   (d) Draw a diagram to show the shape and position of the footprint.

   (e) Measure the size of the footprint.

3. Repeat steps 2(a) to (c) for a person running, hopping with both feet.

4. With your partners find a set of animal tracks. Note the following information about each set of tracks.

   (a) Diagram of the tracks.

   (b) Measure the size of the footprint.

   (c) Measure the distance between each print.

(d) State how you think the animal was travelling (walking, hopping, running).

(e) Location where you first saw the tracks (open field, woods, orchard, park, path, etc.).

(f) Places the animal visited (trees, bushes).

(g) Other signs of the animal (fur, droppings or scats, gnawings, burrows).

(h) Unusual signs of other animals (insect cocoons, bird nests).

(i) Name of the animal.

5. Repeat this for three other sets of tracks.

6. Use the diagrams on the following pages to help you identify the tracks.

HUMAN

ANIMALS IN WINTER DATA SHEET

Diagram of Footstep
Size of footstep_____inches

Diagram of Walking Pattern
Distance between steps___inches

Diagram of Hopping Pattern
Distance between steps___inches

Diagram of Running Pattern
Distance between steps___inches

ANIMAL TRACKS SEEN

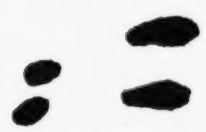
	Diag. of Track	Size of Print	Dist. Between Prints	How Animal Was Travelling	Location Where First Seen	Places Animal Visited	Other Signs From the Animal	Unusual Signs of Other Animals	Name of Your Animal
1									
2									
3									
4									

SOME ANIMAL TRACKS YOU MIGHT SEE

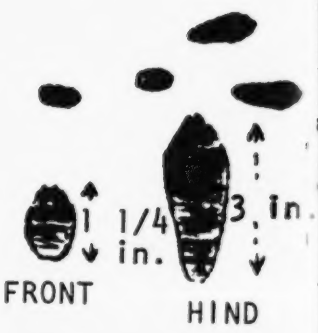
DOG

SKUNK

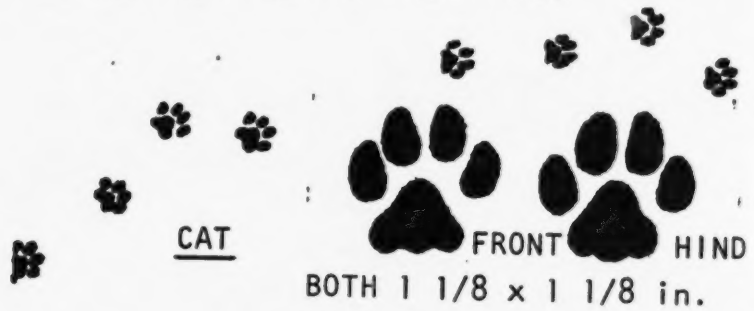
ANIMALS THAT BOUND



COTTONTAIL RABBIT



ANIMALS THAT RUN ON THEIR TOES



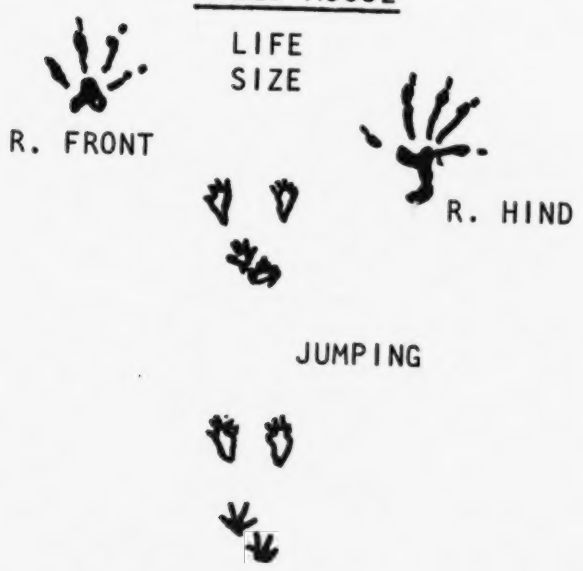
CAT

FRONT HIND

BOTH 1 1/8 x 1 1/8 in.

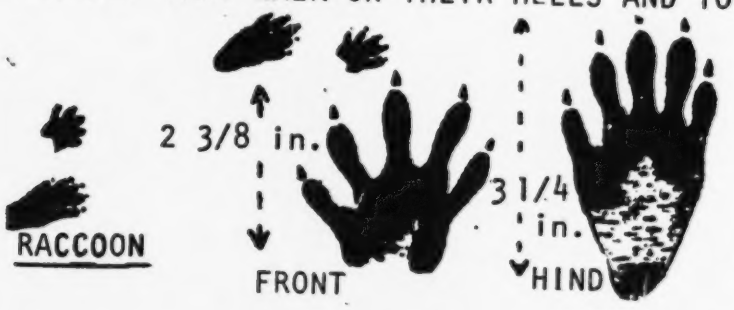
FIELD MOUSE

LIFE SIZE



JUMPING

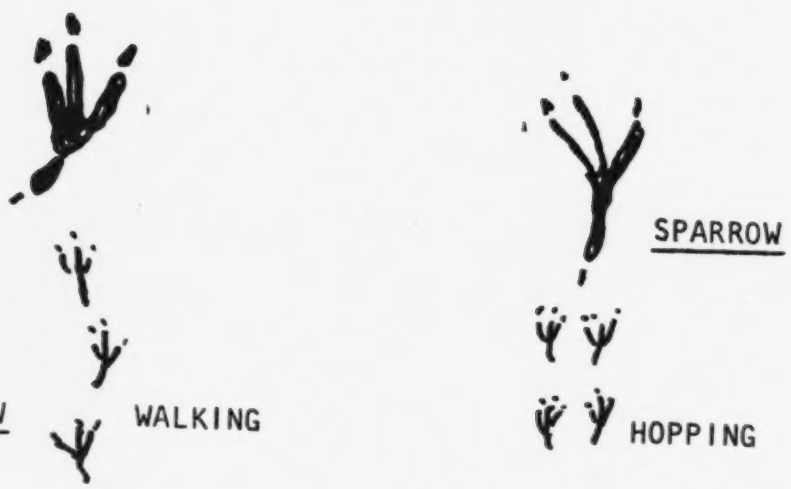
ANIMALS THAT WALK ON THEIR HEELS AND TOES



RACCOON

ANIMALS THAT SHOW THEIR TAIL MARK

MUSKRAT

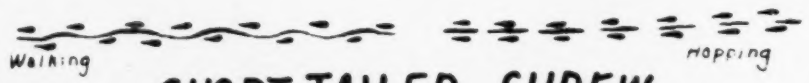


CROW WALKING

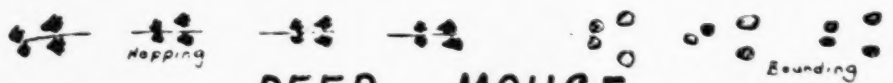
BIRD TRACKS

RING-NECKED PHEASANT

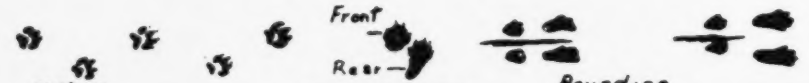
~ TRACKS ALONG THE TRAILS.~



SHORT-TAILED SHREW



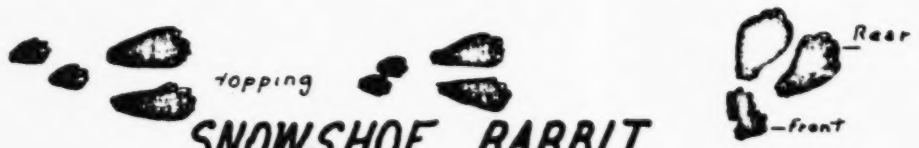
DEER MOUSE



WEASEL

COTTONTAIL RABBIT

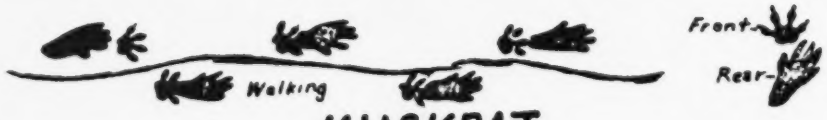
MINK



SNOWSHOE RABBIT

SKUNK

RED FOX



MUSKRAT

RACCOON

WHITETAILED DEER

MALLARD DUCK

GREAT BLUE HERON

YOUNG NATURALISTS CLUB OF O.F.O.N.

FEDERATION OF ONTARIO NATURALISTS
1262 Don Mills Road
Don Mills, Ontario

B 6

WINTER

OUTDOOR EDUCATION NAME _____

A TRIP IN THE WOODS

We are taking a "short" walk in the woods, fields and marsh areas. We will get the most out of this by keeping our eyes and ears open.

Can you answer these questions as you move from place to place? (Not necessarily in order.)

1. Why does it seem colder on the upper fields than in the lower valleys? _____

_____

2. How many different birds have you seen this half day? _____

3. Which animals have:

   (a) hibernated _____

   (b) migrated _____

   (c) kept usual way of life _____

4. Did you see any animal tracks? _____

   What animals did they belong to? _____

5. If you saw any water, was it open or frozen _____

   Why? _____

6. Did all the trees have bare branches? _____

   If not - which did not? _____

7. Name three different trees which you saw.

   (a) _____ (b) _____ (c) _____

8. Did you find any signs of insect life? _____

   If you did see signs, what were they? _____

   _____

9. If there was snow, where was it deepest?

   _____

   Were there any bare areas? _____ Why? _____

   _____

10. What did you particularly notice as being different in the woods today as compared to the rest of the year?

    _____

OUTDOOR EDUCATION CENTRE

Date: _____
Your School: _____
Names: _____
_____
_____

PLANT LIFE -- TREES

Section __

PURPOSE

To identify some common deciduous trees in winter in a woodlot according to the shape of the trees, the bark and the buds.

EQUIPMENT

1. Clipboard
2. Pencil
3. Ruler

METHOD

Go with your teacher into the woodlot.

Tree Shape:

1. Select a tree and draw the shape of it as it appears from a distance.
2. Using the guide shapes found later in this study, name the tree.

Tree Bark:

1. Draw a diagram to show the exact pattern of the bark of the tree.
2. Note and record the colour of the bark.
3. Measure how deep the grooves in the bark appear to be.

Tree Buds:

1. Look for a sapling of your tree type near your tree and carefully examine the buds on a branch.
   Be careful not to break off the branch.
2. Draw a diagram of the end of the branch showing exactly the location of the buds.

3. Measure the length of a bud.

4. See if you can find the parts of a bud as shown on this diagram.

Cottonwood poplar twig showing parts used in naming winter twigs

5. Draw a picture of the leaf scar. This is the mark on the twig where last season's leaf fell from the stem. Usually it is found just below the new bud.

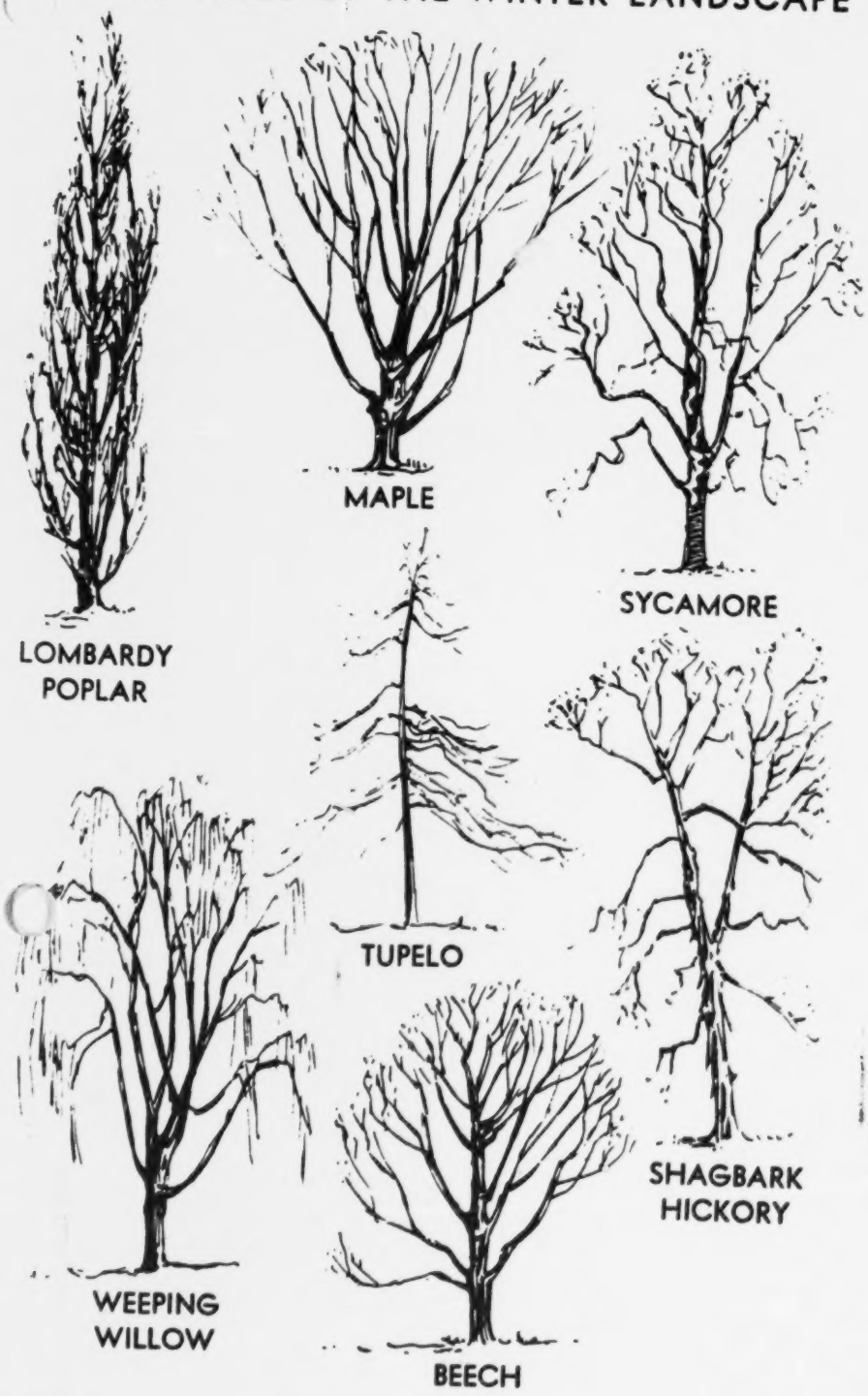
6. Observe whether the buds are opposite or alternate.

BUDS ALTERNATE

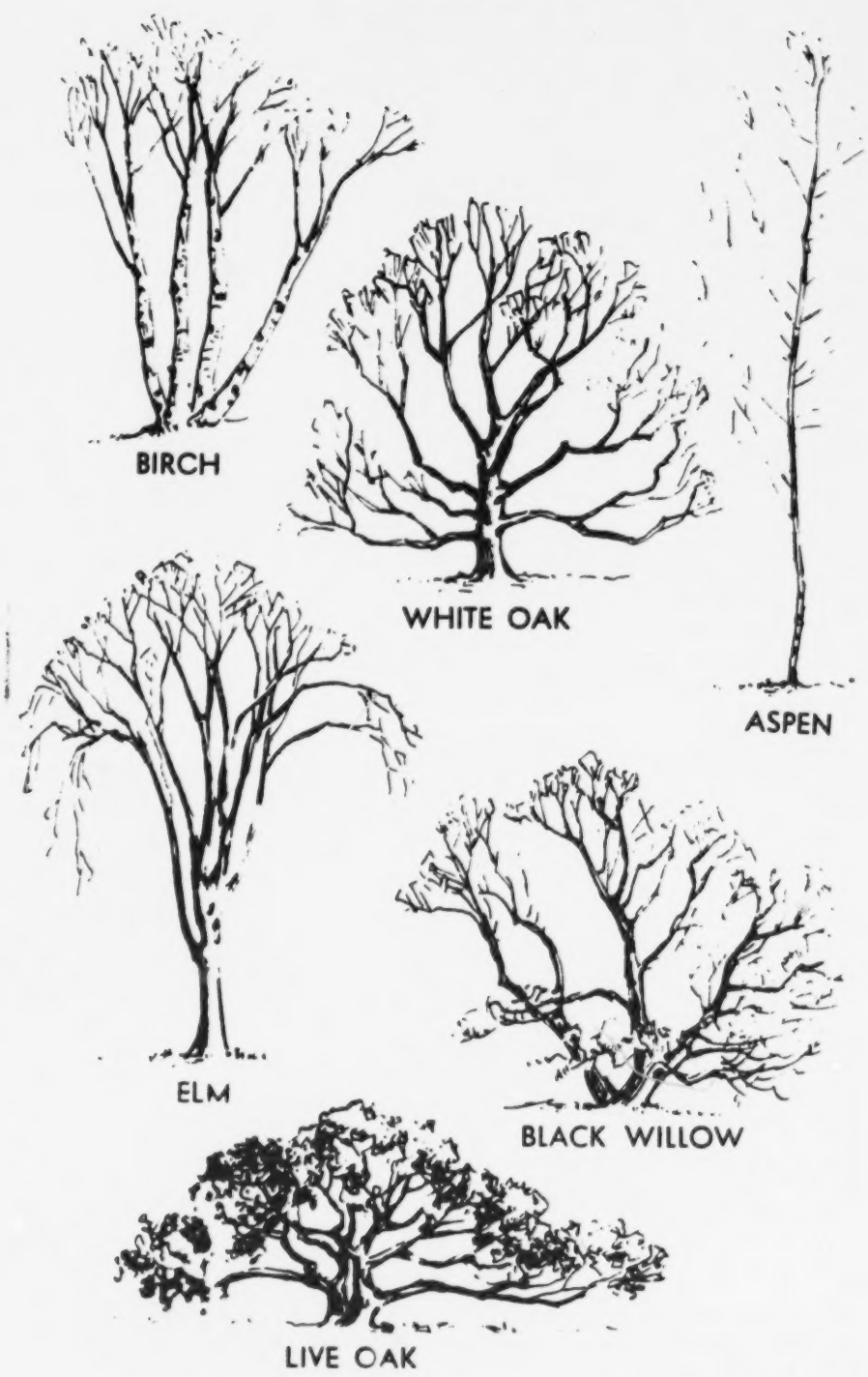
BUDS OPPOSITE

7. Measure the distance between the last set of bud scale scars (ring-like lines) and the end of the twig to see how much it grew in one year.

BARE TREES OF THE WINTER LANDSCAPE



. . . TYPICAL SHAPES



PLANT LIFE -- TREES DATA SHEET

Tree Number 1 Name: _____

Shape (Diagram)	Bark Pattern (Diagram)	Bark Colour
		Depth of Grooves in Bark

Twig (Diagram)	Leaf Scar (Diagram)	Bud Arrangement
		Length of Last Year's Growth

Tree Number 2 Name: _____

Shape (Diagram)	Bark Pattern (Diagram)	Bark Colour
		Depth of Grooves in Bark

Twig (Diagram)	Leaf Scar (Diagram)	Bud Arrangement
		Length of Last Year's Growth

A NON-TECHNICAL WINTER KEY TO TREES

1. Leaves not remaining on trees throughout winter.

    2. Twigs with lateral wart-like branches, slender, glossy brown, resinous taste. .....(1) AMERICAN LARCH

    2. Twigs without lateral wart-like branches.

        3. Arrangement of branches, leaf scars, and buds opposite.

            a. Buds narrow, sharp pointed, brown.

            4. Twigs slender, red to brown, buds red or brown (MAPLES)

                a. Buds narrow, sharp pointed, brown. .....(2) SUGAR MAPLE

                b. Buds red, appressed, edges of leaf scars meeting. ..(3) NORWAY MAPLE

                c. Buds broad, blunt-pointed, reddish colour, often clustered, no odour to twig when broken. .....(4) RED MAPLE

                d. Buds broad, blunt-pointed similar to Red Maple: usually clusters of lateral buds. Fresh twigs have rank odour when broken. .....(5) SILVER MAPLE

            4. Twigs stout, gray to brown in colour, buds brown or black (ASHES)

                a. Buds rusty brown, bark dark brown; cork in texture with diamond shaped fissures. .....(6) WHITE ASH

                b. Buds usually black; bark dark ashy gray without ridges and scaling off easily. .....(7) BLACK ASH

    3. Arrangement of branches, leaf scars, and buds alternate.

        5. Terminal bud present either surrounded by a cluster of buds or borne singly.

            6. Terminal buds surrounded by a cluster of buds of end of twig; fruit an acorn (OAKS)

                a. Buds sharp pointed.

                    aa. Buds smooth, light yellowish-brown twigs, light orange. .....(8) CHESTNUT OAK

                    bb. Buds smooth, reddish-brown, twigs reddish to greenish-brown. .....(9) RED OAK

                    cc. Buds covered with dense yellowish-gray wool. .....(10) BLACK OAK

b. Buds broadly oval, rather blunt at top, somewhat woolly especially upper half; reddish-brown; twigs light red. ....(11) SCARLET OAK

c. Buds rounded, blunt-pointed, reddish-brown. .....(12) WHITE OAK

6. Terminal buds borne singly.

7. Buds have 3-4 dark brown smooth outer scales standing away from bud. .....(13) SHAGBARK HICKORY

7. Buds not as above.

8. Buds covered with close-fitting woolly scales.

9. Twigs with chambered pith (WALNUTS)

a. Pith of twigs cream coloured; mustache of hair beneath bud absent. .....(14) BLACK WALNUT

b. Pith chocolate coloured; mustache of hair present. .....(15) BUTTERNUT

9. Twigs without chambered pith, solid.

10. Twigs brittle, brown, aromatic. ..(16) CUCUMBER TREE

10. Twigs tough, yellowish or reddish colour, hairy toward end; bud scales sulfur coloured. .....(17) BITTERNUT HICKORY

8. Bud scales not woolly on appearance, smooth.

PINNATELY COMPOUND

11. Bud scales 2 united into a cap; twigs brittle with aromatic odour.(18) TULIP TREE

11. Bud scales more than 2 (many)

12. Twigs with wintergreen flavour; terminal bud on spur-like lateral branches only (BIRCHES)

a. Strong wintergreen flavour; twigs reddish-brown; bark smooth, no papery fringes.(19) BLACK BIRCH

PALMATELY COMPOUND

b. Slight wintergreen flavour; twigs yellowish-brown; papery fringes to yellowish bark. .....(20) YELLOW BIRCH

12. Twigs without wintergreen flavour; terminal bud not on spur-like branches.

PINNATE
VENATION

13. Lateral buds usually same size as terminal bud.

    14. Buds long, sharp-pointed.

        a. Buds tinged with purplish-brown lateral buds flattened against twig. .....(21) SHAD BUSH

        b. Buds reddish-brown, lateral buds bending away from twig; buds cigar-shaped. .....(22) AMERICAN BEECH

    14. Buds usually round, red to chestnut brown; thorns on twigs. .....(23) HAWTHORNE

13. Lateral buds smaller than terminal buds.

    15. Bark and twigs spicy aromatic. ....(24) SASSAFRAS

LOBED
SIMPLE LEAF
PALMATE
VENATION

    15. Bark and twigs not spicy aromatic.

        16. Twigs and bark with bitter almond odour and taste, slender (CHERRIES)

            a. Twigs reddish-brown; bark on trunks early becoming scaly (25) WILD BLACK CHERRY

        16. Twigs without bitter almond. odour or taste.

            17. Twigs very tough; terminal bud small and bluntly ovate(26) PIGNUT HICKORY

            17. Twigs decidedly brittle; buds conical; twigs with rather rank odour when broken (POPLARS)

                a. Buds large, shiny, often slightly resinous; twigs bright yellow, lateral buds bending away from twig. (27) COTTONWOOD

                b. Buds medium, dull, dusty looking, generally bending away from twig; twigs reddish-brown. ...(28) LARGE-TOOTHED ASPEN

                c. Buds small showing lateral buds flattened against twig; twigs slender, reddish-brown. .....(29) TREMBLING ASPEN

5. Terminal bud absent (first lateral bud may seem terminal but in fact is not).

OPPOSITE BUD ARRANGEMENT

18. Bud scales one (forms cap over bud).

19. Twigs stout, zigzag and brown; bark mottled. .....(30) SYCAMORE

19. Twigs slender and not zigzag. .....(31) BLACK WILLOW

18. Bud scales many.

20. Buds very small and inconspicuous.

21. Twigs usually bearing spines in pairs at nodes; twigs slender, reddish to greenish-brown, brittle. .....(32) BLACK LOCUST

21. Twigs usually bearing branched thorns; twigs stout zigzag, smooth and glossy. .....(33) HONEY LOCUST

20. Buds medium to large, conspicuous.

ALTERNATE BUD ARRANGEMENT

22. Buds large with characteristic hump, green to red; twigs zigzag. .....(34) BASSWOOD

22. Buds medium, no hump; twigs not zigzag. .....(35) AMERICAN CHESTNUT

23. Twigs stout, pith star-shaped. .(35) AMERICAN CHESTNUT

23. Twigs slender, other than star-shaped pith.

24. Bark of tree scaly.

25. Vertical scales come off easily when rubbed. ....(36) HOP HORNBEAM

25. Scales not easily coming off when rubbed (ELMS)

a. Buds dark, chestnut brown, covered at tip with long rusty hairs; twigs light gray, hairy and mucilaginous when chewed(37) SLIPPERY ELM

b. Buds light reddish-brown, ovate pointed, twigs reddish-brown and smooth(38) AMERICAN ELM

B10

OUTDOOR EDUCATION CENTRE

Date: _____

Your School: _____

Names: _____

_____

_____

GALL SURVEY

Section ___

PURPOSE

To determine the population of goldenrod galls within a certain area and to compare this with other areas.

EQUIPMENT

1. Clipboard
2. Pencil
3. Hula hoop
4. Meter stick

METHOD

1. Go with your teacher to one of the selected areas.

2. Toss your hula hoop into an area where goldenrod plants are growing and carefully slip the hoop down to the ground level without breaking any plants.

3. Stand <u>outside</u> around your hoop area and:

   (a) count the number of goldenrod plants <u>without</u> galls.

   (b) count the number of goldenrod plants <u>with</u> galls.

   (c) measure and calculate the average height of the goldenrod plants.

   (d) measure and calculate the average height of the galls.

4. Repeat No. 3 at least four other times for a total of five samples.

5. Go to another area with your teacher when everyone is ready and repeat the survey.

OTHER THINGS TO DO

1. Cut off one gall only from a plant and using a knife carefully slice it open and draw a diagram of what you see inside.

2. Draw the shapes of the various types of galls that you see.

3. Make a bar graph to show the number of goldenrod plants which have and have not galls for each area you visited.

GALL SURVEY DATA SHEET

1

LOCATION: OPEN FIELD	SAMPLE					TOTAL
	1	2	3	4	5	
Plants without Galls						
Plants with Galls						
Average Height of Plants						
Average Height of Galls						

2

LOCATION: NEAR A ROW OF BUSHES	SAMPLE					TOTAL
	1	2	3	4	5	
Plants without Galls						
Plants with Galls						
Average Height of Plants						
Average Height of Galls						

3

LOCATION: IN AN ORCHARD	SAMPLE					TOTAL
	1	2	3	4	5	
Plants without Galls						
Plants with Galls						
Average Height of Plants						
Average Height of Galls						

OUTDOOR EDUCATION CENTRE

RESOURCE RELATIONSHIPS

The forest is a dynamic, living, ever-changing community of plants and animals dependent upon each other and the other natural resources for survival. Nothing stands still in the forest. Plants and animals are born, grow and die, to enrich and change the soil.

Organic material, thus added, affects the ability of the soil to absorb and hold water that is needed by the plants and animals. As the structure of the soil is changed by decomposing plants and animals, new types of plants are able to grow. This in turn determines the kind and amount of animals that can live in an area.

Man has used and converted the natural resources of the forest to benefit his life. He has done things that have been detrimental to the forest and to himself. He has also done other things that have been beneficial.

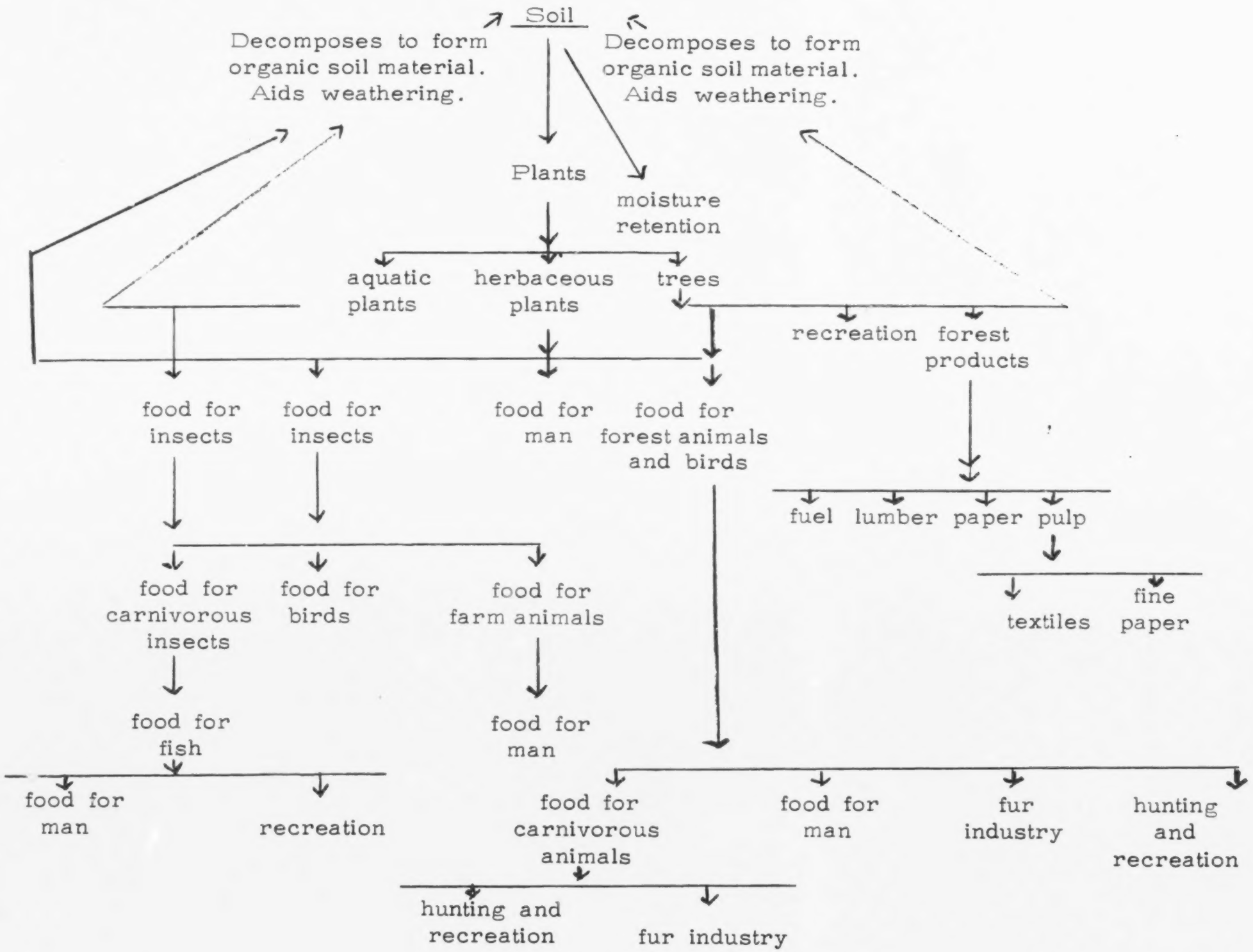
If man is to survive on earth he must learn to live in harmony with the natural resources because he is totally dependent upon them. Past civilizations flourished when they had plenty of natural resources but vanished when the supply of resources dwindled.

The first step in learning how to live with our resources is to understand some of the ways that each natural resource affects the other resources. Shown in chart form are some of the ways that resources affect each other.

These interrelationships could be developed with the class following their field trip.

HOW RESOURCES AFFECT EACH OTHER

	Water	Plants	Wildlife	Man
SOIL	Affects: Runoff Percolation into ground Underground storage Purity by filtration	Anchors plants. Supplies water & minerals. Affects where plants grow by: topography, elevation, soil depth, acid or alkalinity of soil.	Affects where animals live because of topography, elevation, availability of water and types of plants which grow.	Affects: Productivity of soil. Where man lives. What he produces. Economy based on location of resources. Scenic values.
	Soil	**Plants**	**Wildlife**	**Man**
WATER	Washes away soil. Affects types of soil (swamp, desert). Helps break down soil by freezing, flowing, and seepage.	Affects: Transpiration Where plants grow--swamp, hillside, rainfall, fog, snow, etc.	Affects: Aquatic animals Where animals live by their need for water and food.	Provides scenic values, recreation. Affects where man lives (floods, drought), what he grows on soil.
	Soil	**Water**	**Wildlife**	**Man**
PLANTS	Help rocks break into soil by root penetration. Make organic fertilizer which enriches soils and absorbs water. Hold soil in place. Protect soil from rainfall.	Make open spaces in soil for water penetration, tap roots. Shade streams, keep water cool. Use water in transpiration. Purify water.	Provide food, shelter; water in succulent plants for drinking. Give off O_2 for breathing.	Provide: Forage for cattle Shelter Necessities & luxuries of life Recreation Shade Scenic values
	Soil	**Water**	**Plants**	**Man**
WILDLIFE	Make organic fertilizer. Cause soil compaction. Build beaver dams--percolate & hold H_2O in soil, prevent soil erosion.	Pollute water. Build beaver dams--flood control, water storage.	Fertilize plants. Carry seeds. Give off CO_2 that plants need. Destroy plants.	Provide scenic values, recreation, hunting, fishing, livelihood in trapping. Damage crops. Kill livestock.
	Soil	**Water**	**Plants**	**Wildlife**
MAN	Increases & decreases soil productivity. Causes soil erosion. Puts new lands in production. Changes face of the earth. Manages for his benefit.	Stores water in dams. Pollutes water. Diverts water. Uses more water than available in some areas. Manages for his benefit.	Grows new crops. Eliminates natural plants. Clears land of plants. Harvests trees & grass. Manages plants for his benefit.	Harvests wildlife and natural predators. Upsets nature's cycle of animals. Manages for his benefit.


Soil
Decomposes to form organic soil material. Aids weathering.
Decomposes to form organic soil material. Aids weathering.
Plants
moisture retention
aquatic plants
herbaceous plants
trees
recreation
forest products
food for insects
food for insects
food for man
food for forest animals and birds
fuel
lumber
paper
pulp
textiles
fine paper
food for carnivorous insects
food for birds
food for farm animals
food for fish
food for man
food for man
recreation
food for man
food for carnivorous animals
food for man
fur industry
hunting and recreation
hunting and recreation
fur industry

THE FORMATION OF SOILS AND OUR PRESENT LANDSCAPE

Fundamental to an understanding of the relationship of plant and animal communities, including man's communities, is an appreciation of how soils and landscape were formed, how they vary from region to region, and how they have been shaped by our climate into regions supporting very different plant and animal communities. For example, grasses grow on the rich prairie soils where rainfall is light, and the less the amount of rainfall, the shorter is the grass which grows there. Buffalo, antelope and prairie dogs were associated with grasslands. The grass and animals mentioned make up a community. Further north, rainfall is light, but temperatures are so low that frost remains ever in the soil. There the arctic hare, lemming, arctic fox, ptarmigan and snowy owl form a community with the herbs and grasses which are able to carry on in soil which thaws for a few inches during a few months of the year.

In the Great Lakes Region, the climate and soils foster a vegetation of hardwood and coniferous trees; sugar maple, beech, hemlock and white pine are characteristic of average sites. Very wet areas may support white cedar. Spruces, balsam, fir and tamarack are found in the northern parts. Poplar and birch grow first on cutover or burned lands.

THE SUCCESSION OF PLANT AND ANIMAL LIFE

Succession as used in the science of ecology deals with the change in vegetation and animals over a period of time. The plants, and animals to a lesser degree, assist in bringing about the changes. An understanding of succession is of the utmost importance to the conservationist, because, in land or water management, natural succession may impede or speed up a particular programme. For example, the harvest of larger trees in a woodlot will "release" smaller trees from competition and promote their maturing at an earlier date. Adding large amounts of sewage to a lake may accelerate its transformation to a swamp and eventually a bog. It should be apparent that many communities of plants and animals may rise and fall during succession on a particular area.

Two types of succession should be understood. First, that which takes place in the water where submerged, floating and emergent aquatics, bog plants, shrubs and trees develop in that order, turning aquatic into a terrestrial habitat. And second, that succession on dry land where annuals, biennials, perennials, shrubs and trees develop consecutively. Each species of our plant and animal communities fits somewhere in either of the two types of succession. The trembling aspen is a tree tolerant of direct sunlight which pioneers on cutover or burned lands. The sugar maple, incapable of development in bright sunlight, grows in the shade of the aspen, and persists to produce generations of young maples which grow and die or are harvested. The American beech persists in the company of the maple. That explains why the sugar maple -- beech forest is termed the climax forest of the region at this time. The sugar maple -- beech woodlot, barring accidents or climatic changes, is the final community and the only community which can persist in its existence on the site. Even a wet site will dry up in time and support a sugar maple -- beech woods.

This aspect of succession brings up a vital point in conservation. Conservation means wise use. It does not mean that our natural resources should be preserved without their being utilized for we much appreciate that natural succession will permit our using a crop that will be swept aside and replaced anyway.

Neither must we forget that young plants and animals are produced in such abundance that few are likely to survive. Nor should we fail to appreciate that any area of land has a limited capacity for sustaining life. It can support so much and no more. It may be twenty cords of pulpwood on an acre or one ton of livestock. That is why such a loss may occur when an over-abundance of young plants or animals struggle for survival. This crop may be harvested by man. In fact, if he fails to harvest a resource adequately, whether it be a row of carrots, a pondful of largemouth bass or a woodlot of white pine, the final production may be made up of too many useless individuals. All students know the folly in not thinning carrots.

The foregoing represents one of the most important aspects of conservation, and one which all too often is misunderstood by school children. Conservation does mean use. However, it is restricted to wise use, or "use without using up". To make WISE use of any resource, a knowledge of the resource is vital.

NATURAL COMMUNITIES AND NICHES

Several communities have been mentioned, and the importance of such an approach should be stressed further. Often natural history is taught species by species. Ecology, or the study of species in relation to others in the same community and to physical and chemical factors, is too often neglected. A list of birds seen on August 23 may have required a great deal of note taking. But with a few additional notes, and a resulting list of birds seen in the marsh, in the open fields, in the second-growth woodlot and in the mature woods on August 23, the purpose has changed from merely making a list to a true study of natural history. Students should be encouraged to draw conclusions from observations. Swallows arrive later than most migrants. They depart earlier. Why? Would it be because swallows gather food on the wing? Flying insects must make up their main diet. In fact, are not the swallows very particularly adapted for such a pursuit? They have wide mouths, long wings and poorly developed feet. Flying insects must be very important to them although common during warm summer months only. Our conclusion -- swallows are restricted to a shorter stay in our climate because of feeding habits, relying as they do on summer flying insects.

Each species in a community has a special position and role to play. Some are predators. Many are to be eaten. Some, like our swallows, feed on aerial life. Others, like the robin, feed on subterranean life. This can be likened to our own organization of society. We have lawyers, doctors, bakers, barbers. The position and role of a particular species of plant or animal is its niche in the community.

We could relate all the niches in a community in a food chain. We would discover how few animals occur at the top of the pyramid of numbers, and how many form the base. One pound of grasshoppers will not produce one pound of red fox. Naturally, there is a loss in the process, so we might expect to have such a pyramid. Perhaps for a simple situation, the numbers of individuals in all steps in a food chain could be equated. Now if one species, that is, one entry in the equation, were disrupted, the others would feel some effect. This "balance" as it is often called, and the upsetting of the balance through man-made or natural causes is the most important feature of the community. And remember also that the soil and water provide the real base of this pyramid. The misuse of soil and water will undermine the community.

THE CLASSIFICATION AND IDENTIFICATION OF LIVING THINGS

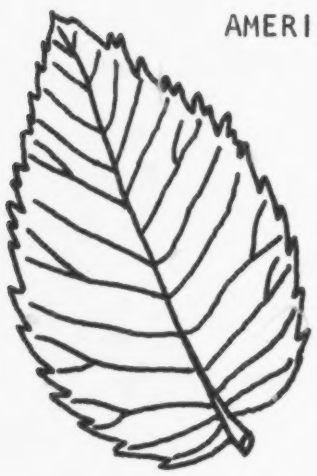
The structure of plant and animal groups may be compared with the student's own family. For example, the family of maples corresponds to the student's immediate family. Each child in the family is unique. In the maple family we have in our region the red, silver, sugar, black, mountain and Manitoba maples. We may continue with our comparison. The sugar maple grows to a large size; the mountain maple is a rather small tree. Likewise, some members of the student's family are destined to be taller than others. The niche of the red maple is on wet soils, in the company often of white elm and black ash. The sugar maple forms the climax forest with the beech on well drained loamy soils. The student may be a doctor someday. His or her brother may be a commercial pilot.

Among plants and animals there are many families. Besides the maple family, there are the elm, the beech and many other families. Individuals may be cousins to members of different families. However, members of the pine family appear to be so different from maples, elms, ashes and oaks, that they could hardly be called cousins.

The members of the maple family have many features in common. All have branches occurring opposite each other on the limbs. The shape of the leaves, the colour of the bark, the places where the different maples grow, serve to identify the individual species in the family.

Students should know several fundamentals before they attempt tree identification. The names of the parts are important. What is a petiole? What is a compound leaf? What is opposite branching? Alternate branching?

The foregoing has dealt with trees because they are large, common even in the cities, and so serve as excellent examples. The same principles would apply to fish, birds or ferns.



AMERICAN ELM

WHITE BIRCH

THE ADAPTATION OF PLANTS AND ANIMALS

Certain characteristics that any living thing possesses adapt it to life in its particular niche. As well, each plant or animal must be able to survive the four so widely different seasons. Some animals migrate, some hibernate and some rest in stages very resistant to cold weather. Others carry on and are adapted to chilly weather to do so. Long, heavy fur and a deep layer of body fat protect many mammals. A nature hike covers one season and could well serve as a stepping stone to a discussion of animals through the seasons.

Animals are adapted to a certain mode of locomotion and manner of nesting and procuring food. Hawks have sharp, hooked beaks for eating their prey; sparrows possess stout, bulky bills for shelling seeds; ducks have flat bills with serrated margins serving as sieves in straining out aquatic foods.

FOLLOW-UP ACTIVITIES

It is the hope of the Outdoor Education staff that the activities done at the Centre should provide a starting point for as many topics as possible. While the pupils are at the Centre the staff will attempt, if time allows, to begin to consolidate the data collected. However, if the day is to be truly meaningful this consolidation and conclusion should be carried on in the home classroom.

Some of the information collected could be reproduced on larger sheets, overhead projection transparencies, etc. for further discussion by the whole class. At this time the pupils should compare their results with those of the rest of the class. If possible, generalizations should be made concerning certain facts. The teacher should try to interrelate the information in order to get an overall summary of the characteristics of the particular area on the site which was studied. In some studies, the interdependence of animals, plants, soils and climatic conditions within a certain area should be stressed (see resource relationships, page 110). For example, it was found that most plants had long tap roots because the soil was hard and dry. It was noted that some plants did not grow very tall near pathways. Most animals were found near the ground level because their food was there. There was also some protection from the plants, more heat, moisture and less winds.

There are a great many ways which a class can make use of the information and experiences from the Outdoor Centre. The teacher should attempt to have the class make use of as many different subject areas as possible, eg.:

1. Mathematics

   (a) Make graphs showing the heights of trees
   (b) A comparison of the numbers of trees of various kinds, or a comparison of the number of children having certain pace lengths
   (c) Keep a line graph of comparative temperatures
   (d) Compare temperatures in sun and shade, on bare ground and in grass
   (e) Practice calculating the heights of trees/buildings
   (f) Taking measurements of a tree involving board feet
   (g) Learning and using a forester's formula for measuring the yield of lumber from a given tree
   (h) Determine the size of certain areas through the use of such measurements as acres, square miles, square yards, square feet
   (i) Making graphs of daily weather records
   (j) Estimating the percentage of areas containing swamps, fields, and woodlands
   (k) Determining the percent of a slope
   (l) Observing geometric patterns in nature

2. Geography

   (a) Learning how to use map instruments
   (b) Surveying; making maps or scale models of the local terrain
   (c) Pacing the distance during a hike; determining time required to walk a mile
   (d) Learning the use of a compass (orienteering)
   (e) Dioramas of activities done at the Centre

3. Social Studies

(a) Learn more about lumbering in Ontario
(b) Learn about early farming in Ontario
(c) Constructing early pioneer tools out of natural materials
(d) Learning the effects of local natural resources upon the cultural life and traditions of the pioneer
(e) Studying the economical, and aesthetic values of the local natural resources
(f) Studying the problem of land use and migrating populations

4. Language Arts

There are many activities in outdoor education which aid the development of communications skills in students. They include:

(a) Making field notes
(b) Writing letters to conservation agencies for information
(c) Writing stories about the out-of-doors
(d) Writing reports and evaluations of field trips
(e) Storytelling
(f) Poetry writing
(g) Reading and listening to stories, prose, and poetry about the out-of-doors
(h) Role playing about their experiences

5. Art and Music

(a) Using natural materials as designs for various works of art
(b) Collecting, arranging, painting dried bouquets of flowers
(c) Drawing and painting local outdoor scenes
(d) Sketching with charcoals
(e) Print designs using articles from nature, eg. bark, stones
(f) Collecting seeds, flowers, grasses, and stones for making special creative arrangements
(g) Making leaf and fern print through the use of various media
(h) Constructing a relief map of the area
(i) Sandtable models
(j) Murals
(k) Dioramas
(l) Picture making
(m) Designing charts and exhibits of natural objects
(n) Learning and singing folk songs and studying their meaning
(o) Hiking in rhythm while singing camp songs
(p) Listening to the Music of Beethoven (Pastorale), Edward McDowall (Woodland Sketches), Groffé (Grand Canyon Suite), and others and relating them to the outdoors

6. Health

(a) Developing proper eating habits
(b) Learning to dress properly for the outdoors, depending upon the season
(c) Learning precautions to follow when looking for drinking water outdoors
(d) Learning first aid

7. Physical Education

(a) Hiking
(b) Learning the proper way to ascent and descent a steep slope
(c) Learning to use forest tools properly
(d) Building and extinguishing a campfire
(e) Planting trees
(f) Trailing and tracking
(g) Learning proper outdoor manners

8. Science

(a) Studying the physical features of the local terrain -- how it was formed, composition of local rocks and minerals and how they were formed
(b) Observing evidence of the interdependence of all living and inanimate things
(c) Studying behaviour of animal life through observation of animal tracks and other evidences indicating their activity
(d) Becoming more familiar with the value of the wildlife, vegetation, soil, rocks and minerals of the area
(e) Deducing through evidence why certain forms of animal and plant life live in a particular area and not elsewhere
(f) Learning certain biological principles found within a terrarium and aquarium
(g) Studying construction habits of birds(nests), spiders(webs), insects(cocoons)
(h) Making soil experiments (testing and classifying)
(i) Using simple keys for identification of insects and plants
(j) Studying different types of vegetation at different elevations
(k) Observing how soil erosion and forest fires affect the ecology of a given area
(l) Learning forest and wildlife management practices

FEEDBACK

In order that we may show others who will be coming to the Outdoor Education Centre how successful a day you and your students have had and how you have followed it up, we would request that you send some examples of these for display purposes. These articles will be returned after approximately one month's display. Please print the name of your school, room number on each article you send.

These results should be taken or mailed either to the specific Outdoor Centre or the Science Department, Education Centre, 100 Main Street West, Hamilton 10, Ontario within two to three weeks of your visit.

COMMENTS

The staff of the Outdoor Education Centre would appreciate any comments and suggestions which will help us to make this program an even greater success.

OUTDOOR EDUCATION CENTRE BOOK LIST

NO.	TITLE	AUTHOR	PUBLISHER
A1	The Insects	P. Farb	Time--Life
A2	Caterpillars	D. Sterling	Doubleday
A3	Insects--Hunters & Trappers	R.E. Hutchins	Rand McNally
A4	Insect Builders & Craftsmen	R.E. Hutchins	Rand McNally
A5	The Insect World	J. Pallister	Parents Magazine
A6	Wonders of the Anthill	S.A. Lavine	Dodd,Mead & Co.
A7	Insects	J. Clegg	Bruce & Gawthorne
A8	Wonders of the Butterfly World	H. Simon	Dodd,Mead & Co.
A9	Animals without Backbones	R.E. Pfadt	Follet
A10	Spiders	R.S. Dupre	Follet
A11	Insects	J.S. Brouillette	Follet
A12	Ants	C.A. Schoenknecht	Follet
A13	Insects	H.S. Zim & C. Cottam	Golden Press
A14	A Field Guide to Butterflies	A.B. Klots	Houghton Mifflin
A15	Spiders & their Kin	H.W. Levi & L. Levi	Golden Press
A16	Butterflies & Moths	R. Mitchell & H. Zim	Golden Press
A17	The Insect Guide	R.B. Swain	Doubleday
A18	The Field Book of Insects	F.E. Lutz	Putnam
A19	Insects & the Homes they Build	D. Sterling	Doubleday
A20	The Beginning Knowledge Book of Butterflies	K. Sammis	Rutledge
A21	Introducing the Insect	F.A. Urquart	Clarke & Irwin
A22	Spiders,Snakes & Other Outcasts	R. Froman	Lippincott

NO.	TITLE	AUTHOR	PUBLISHER
B1	The Fish	F.D. Ommaney	Time--Life
B2	Guide to Freshwater Invertebrate Animals	T.T. Macan	Longmans
B3	Fishes	H. Zim & H. Shoemaker	Golden Press
C1	A Field Guide to Reptiles & Amphibians	R. Conant	Houghton Mifflin
C2	Reptiles & Amphibians	Federal Writers Publications	Albert Whitman & Co.
C3	Reptiles & Amphibians	H. Zim & H. Smith	Golden Press
D1	The Reptiles	A. Carr	Time--Life
D2	Reptiles of the World	R. L. Ditmars	Macmillan
D3	The Snakes of Ontario	E.B.S. Logier	University of Toronto
D4	Frogs & Toads	C. Schoenknecht	Follet
D5	A Field Book of Snakes	K.P. Schmidt & D.D. Davis	Putnam
D6	The Young Specialist Looks at Reptiles	A. Leutscher	Burke
E1	The Birds	R.T. Peterson	Time--Life
E4	Birds	W. Zim & I.N. Gabrielson	Golden Press
E2	Water,Prey & Game Girds of N.A.	A. Wetmore	National Geographic
E3	Song & Garden Birds of N.A.	A Wetmore	National Geographic
E5	A Field Guide to the Birds	R.T. Peterson	Houghton Mifflin
E6	Backyard Birds	H. Rush	Rutledge

NO.	TITLE	AUTHOR	PUBLISHER
F1	Canadian Mammals	A. Cameron	Dept. of Northern Affairs
F2	Bats	R. VanGelder	Follet
F3	Animal Tracks	G. Mason	Morrow
F4	The Mammal Guide	R. Palmer	Doubleday
F5	Mammals	H. Zim, D. Hoffmeister	Golden Press
F7	A Field Guide to Mammals	W. Burt & R.P. Grosschneider	Houghton Mifflin
F6	A Field Guide to Animal Tracks	O. Murie	Houghton Milflin
F8	Animals Without Backbones I	R. Buchsbaum	Pelican
F9	Animals Without Backbones II	R. Buchsbaum	Pelican
F10	Tracks	E. Ennion & N. Timbergen	Oxford
F11	The Mammals	R. Carrington	Life--Time
G1	Plants from Sea to Sea	F.H. Montgomery	Ryerson Press
G2	Flowers	H.F. Zim	Golden Press
G3 } G4 }	Native Wild Plants	F.H. Montgomery	Ryerson Press
G5	A Field Guide to Wild Flowers	R.T. Peterson	Houghton Mifflin
G6	Beginner's Guide to Wild Flowers	E.H. Hausman	G.P. Putnams
G7	American Wild Flowers	F.S. Mathews	G.P. Putnams
G8	Wild Flowers	Alois Kosch	Burke
H1 - H12	Ontario's Weeds	F.H. Montgomery	Ont. Dept. of Agriculture
H13	Weeds	F.H. Montgomery	Ryerson Press

NO.	TITLE	AUTHOR	PUBLISHER
I1	A Field Guide to Ferns	Boughton Cobb	Houghton Mifflin
I2	A Field Book of Common Ferns	H. Durand	G.P. Putnams
I3	Mushroom Collecting for Beginners	J. Walton Groves	Queen's Printer
I4	Mushrooms of Canada	J. Walton Groves	Queen's Printer
I5	A Field Book of Common Mushrooms .	W.S. Thomas	G.P. Putnams
J1	The Forest	P. Farb	Life Inc.
J2	The Plants	F.W. Went	Life Inc.
J3 - J5	Winter Twigs	Verne Rockcastle	Cornell Press
J6	Botany	M.K. Hage	Steck-Vaughn Co.
J7	Trees	Alois Kosch	Burke
J8	A Field Guide to Trees & Shrubs ..	G.A. Petrides	Houghton Mifflin
J9	Trees	H.S. Zim	Golden Press
J10	Backyard Trees	Hanniford Rush	Rutledge
K1	The Earth	A. Beiser	Life Inc.
K2	The Mountains	L.J. & M. Milne	Life Inc.
K3	A Field Guide to Rocks & Minerals	F.H. Pough	Houghton Mifflin
K4	Fossils	F.H.T. Rhodes	Golden Press
K5	Rocks & Mineral Collecting in Canada	A.P. Sabina	Queen's Printer
L1 - L2	Ontario Soils	L.R. Webber	O.A.C.
L3	Soil	R. Cromer	Follet
L4	The World of Soil	Sir E.J. Russell	Collins, St. Jame's Place London
L5 - L6	Ontario Soil	L.R. Webber	O.A.C.

NO.	TITLE	AUTHOR	PUBLISHER
M1	The Life of the Pond	W.H. Amos	McGraw-Hill
M2	In Ponds & Streams	M.W. Buck	Abingdon Press
M3	Freshwater Ecology	T.T. Macan	Longmans
M4	Pond Life	G.R. Knapp	Wheaton of Exeter
M5	Let's Go to the Brook	H.E. Huntington	Doubleday
M6	Pond Life	W. Engelhart	Burke
M7	Pond Life	G.K. Reid	Golden Press
M8	Field Book of Ponds & Streams	A.H. Morgan	Putnam
M9	Freshwater Life	L.A. Hausman	Putnam
N1	Ecology	Life Nature Library	Time--Life
N2	Animal Behaviour	Life Nature Library	Time--Life
N3	In Woods & Fields	M. Buck	Abingdon Press
N4	Source Book for Science Teaching	UNESCO	UNESCO
N5	Introduction to Plant Ecology	M. Ashby	Macmillan
N6	Introduction to Field Biology	Bennett & Humphries	Arnold
N7	Let's Go Outdoors	H. Huntington	Doubleday
N8	Nature is My Hobby	C. Adams	A. Wheaton
N9	Junior Naturalist's Handbook	G. Watson	A. & C. Black
N10	Woodland Ecology	E.G. Neal	Heinemann
01	Playground Activities--Nature Study	W. Gunn	Fed. of Ont. Naturalists
02	Conservation & Nature Activities	Audubon	Audubon
03	Conservation in Canada	McConkey	Dent
04	Nature Activities & Conservation	W. Hillcourt	Putnam
05	Nature Activities & Conservation	W. Hillcourt	Putnam

NO.	TITLE	AUTHOR	PUBLISHER
P1	Complete Guide to American Wildlife	Collins	Harper
P2	Weather	Burnett--Zim	Golden Press
P3	Study for Open Places	MacKillican, Wilson, Woolley	Ryerson Press
P4	Field Book of Natural History	Palmer	McGraw-Hill
P5	Life of the Forest	J. McCormick	McGraw-Hill
P6	Audubon Nature Encyclopedia-- Vol. 1	National Audubon Society	Curtis
P7	Audubon Nature Encyclopedia-- Vol. 2	National Audubon Society	Curtis
P9	Audubon Nature Encyclopedia-- Vol. 4	National Audubon Society	Curtis
P10	Audubon Nature Encyclopedia-- Vol. 5	National Audubon Society	Curtis
P11	Audubon Nature Encyclopedia-- Vol. 6	National Audubon Society	Curtis
P12	Audubon Nature Encyclopedia-- Vol. 7	National Audubon Society	Curtis
P13	Audubon Nature Encyclopedia-- Vol. 8	National Audubon Society	Curtis
P14	Audubon Nature Encyclopedia - Vol. 9	National Audubon Society	Curtis
P15	Audubon Nature Encyclopedia-- Vol. 10	National Audubon Society	Curtis
P16	Audubon Nature Encyclopedia-- Vol. 11	National Audubon Society	Curtis
P17	Audubon Nature Encyclopedia-- Vol. 12	National Audubon Society	Curtis

OUTDOOR EDUCATION CENTRE

EQUIPMENT AVAILABLE

24	Meter Sticks
4	Tape measures 100'
36	18" rulers
2	LaMotte Soil Test Kits
4	Soil Sieves
8	Soil Samplers
12 rls	PH paper
6	Trowels
6	Garden Spades
2	Increment Borers (wood only)
5	Ice Augers
12	Plastic Pails
	Plastic Vials
8 pr.	Chest waders
6	Plastic Funnels
6	Graduated Cylinders - plastic
8	Retort stands - rings
12	Dissecting kits
12	Magnifying Glasses
6	Microscopes - zoom - monocular
	Microscope Slide Blanks
24	Compasses
24	Drawing Compasses
24	Protractors
12	Transect poles
12	Transect levels
12	Transect lines (50 metre)
12	Clinometers
6	Hoops (36" diameter)
3	Wind gauges
12	Thermometers - C°
6	Soil Thermometers
8	Sling Psychometers
1	Hygrometer
1	Barometer
2	Maximum - Minimum Thermometers
12	Aquarium Type - Thermometers
12	Biltmore Sticks - Hypsometers
12	Tree Calipers
50	Live Animal Traps
12	Geologists Hammers
6	Geologists Chisels
6	Insect Nets
2	Seine Nets
2	Light Meters
	Plaster of Paris
24	Tape Measures 5'
	Graph Paper

OUTDOOR EDUCATION CENTRE

AUDIO-VISUAL RESOURCES

The following films could be used to either prepare your class for its trip or as a follow-up method after the trip. These are available from the Audio-Visual Dept. and may be ordered in the usual manner.

Algae(1964): Simple Plants.....5017
Angiosperms: The Flowering Plants.....5021
Anthropods: The Jointed Legged Animals.....5031
The Community.....5002
Distribution of Plants and Animals.....5004
Fungi.....5016
The Grasslands.....5006
Natural Selection.....5049
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Filmstrips and Film Loops

The following filmstrips and film loops are available from the Outdoor Education Centre for one week only. These may be ordered from the Outdoor Education staff by phoning 527-5092, ext. 373 and they will be sent out by Board delivery. They must be returned to the Science Department no later than one week after they have been received at the school.

Filmstrips

Diminishing Resources	189
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Living Things in the City	11720
Plant & Animal Relationships	10790
Ecological Systems	434M
Learning About Familiar Plants	440M
Wildflowers: Eastern Canada	163548
Spring Wildflowers	163540
A Visit to a Pond	165151
A Visit to the Woods	165154
Forestry in the Canadian Shield	165610
Living Things & Their Habitats	70W3100
Environmental Pollution	70W3800
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Collecting Insects & Other Small Animals	11390
Hand Lens & Microscopic Techniques	11600

Film Loops

Collecting Plankton	80156
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Collecting Small Arthropods	80638
Collecting Small Bottom Dwelling Organisms	80153
Collecting & Recognizing Stream Organisms	80159
Collecting Nematodes	80637
Recognizing Edge Community Organisms	80147
Recognizing Small Dwelling Organisms	80154
Recognizing Large Bottom Dwelling Organisms	80150
Collecting & Recognizing Surface Film Organisms	80148
Collecting Insects: By Hand	80070
Collecting Insects: Butterfly Net	80071
Collecting Burrowing Organisms	80151
Collecting Edge Community Organisms	80146
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OUTDOOR EDUCATION CENTRE

TOPIC SELECTION FORM

After discussing the possible program with your class, please check off your selections.

The total number of hours of activity for the day must be 4 hours. A two hour selection must be in either the morning or the afternoon session.

Complete the entire form and make a copy of it for your records.

Date of Visit _____ School _____

Teacher Who is Coming _____ Number of Girls in Class.... ☐

Number of Boys in Class..... ☐

Total in Class..... ☐

Which Centre: East ☐ West ☐

Number of Pupils in: Grade 5 ☐ ? Grade 6 ☐ ? Grade 7 ☐ ?

General Ability of Class: Below Average ☐ Average ☐ Above Average ☐

PROGRAM SELECTION

(must total 4 hours)

Autumn-Spring

✓

- ☐ A1 Grassland.....2 hrs.(east only)
- ☐ A2 Woodland.....2 hrs.(both centres)
- ☐ A3 Marshland.....2 hrs.(west only)
- ☐ A4 Ravines.....2 hrs.(both centres)
- ☐ A5 Contour Mapping.....2 hrs.(both centres)
- ☐ A6 Walk.....1 hr.(both centres)
- ☐ A7 Compass-Orienteering.1 hr.(both centres)
- ☐ A8 Art Appreciation.....1 hr.(both centres)
- ☐ A9 Land Use Survey.....1 hr.(both centres)
- ☐ A10 Stream Study.....2 hrs.(both centres)
- ☐ A11 Moss Distribution....2 hrs.(west only)

Winter

✓

- ☐ B1 Woodlot Survey.....2 hrs.(both centres)
- ☐ B2 Moss Distribution....2 hrs.(west only)
- ☐ B3 Grassland-Woodland...2 hrs.(both centres)
- ☐ B4 Marshland in Winter.2 hrs.(west only)
- ☐ B5 Animals in Winter....2 hrs.(both centres)
- ☐ B6 Winter Walk.....1 hr.(both centres)
- ☐ B7 Compass-Orienteering.1 hr.(both centres)
- ☐ B8 Contour Mapping.....2 hrs.(both centres)
- ☐ B9 Trees in Winter.....1 hr.(both centres)
- ☐ B10 Gall Survey.....1 hr.(east only)

The staff reserves the right to last minute changes due to weather and land conditions.

Address of School _____ Phone _____

When completed, detach 1 copy and send no later than 1 week preceding your visit to:

Outdoor Education Centre
Science Department
Education Centre
100 Main Street West
Hamilton 10, Ontario